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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLXVIII. No. 3210.] LONDON, NOVEMBER 19, 1924. [76TH YEAR. PRICE 1s.

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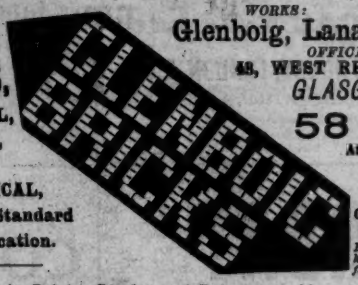

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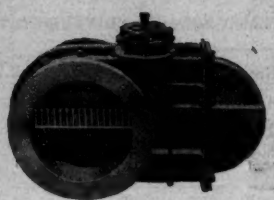

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VOL. CLXVIII., No. 3210.] WEDNESDAY, NOVEMBER 19, 1924. [76TH YEAR.

EDITORIAL NOTES.

A Plea for the Defence of Gas Investors.

EMPHATICALLY we urge that immediate concerted action should be taken to defend gas share and stock holders from company promoters who are attempting to enrich themselves on the strength of the good reputation of the industry among investors. This is a matter in which the Gas Companies' Protection Association might initiate a movement, in view of the fact that the Companies the Association represent would not be in existence without the capital that has been subscribed by the public. The time has come when gas shareholders through the length and breadth of the country should be warned against these parasitical promoters. This should have been done long since; but the opportunity is again presented with a recrudescence of the evil. During the past fortnight a prospectus of the Navenby and Wellingore Gas Light and Coke Company, Ltd.—quite a microscopical specimen of a gas undertaking—has been broadcasted (from the source of several similar promotions) among gas stock and share holders. We know the circulation has been immense; and we are also aware that the resources of the promoters of the concern in the way of lists of proprietors in well-established gas companies must, at their offices—No. 43, Cannon Street—or elsewhere, be very considerable. In one case with which we are intimately acquainted a gas proprietor, with investments in various London and Suburban companies and not provincial ones, has received no less than eight copies of the Navenby prospectus; and at the "JOURNAL" office we have had several copies delivered from recipients of this precious document, and these recipients are well scattered over the country. Those responsible for the issue of these prospectuses inviting subscriptions for capital do their work thoroughly. The spending of money in widely casting their net obviously pays them.

Those who are the mainsprings in this movement now keep themselves largely in the background, presumably because their names have not a very good odour through association in times past with gas and other concerns that have found their way into the hands of official receivers, and have eventually changed ownership. On the surface new figures and names have appeared; and in recent promotions issued from the same quarter the same names are found in one capacity or another—as subscribers of shares, as Directors, or in official office. But they are all concerned in the operations of the same promoting factory. For example, we see that one of the Navenby Directors is a Director of the Electric Light, Power, and Contracts Finance Corporation, a Director of the Heathfield and Waldon Gas Light and Coke Company, and of the Warwickshire and South Midlands Electricity Supply Corporation—promotions upon which we have formerly animadverted. Another is also a Director of the Heathfield and Waldon Gas Light and Coke Company. A third Director is described as an "electrical consultant;" but we have never met with his name in connection with any prominent electrical enterprise. A fourth Director is Mr. Reginald H. Smith, described as a "Gas Engineer" (late R.E.), and he is Chairman of the Electricity, Gas Share Debenture, Investment, and Guarantee Trust, Ltd.—a title of sufficient length and weight to impress the credulous. Can anybody enlighten us regarding the standing of Mr. Reginald H. Smith in the profession of gas engineering? Because we who are supposed to know who's who in the gas industry cannot call to mind "Reginald H.," though the cognomen "Smith" in the profession is not uncommon. The Trust with the elongated name of which Mr. Smith is the Chairman is the one which recommends as an investment the capital proposed for the Navenby undertaking; and to the London Office which gives habitation to these concerns, and which must now be uncomfortably crowded, the applications and cheques—particularly the latter—must be addressed by those desiring to participate in the new adventure.

The promoters of the Navenby enterprise have not been long in finding out that the association of gas and electricity supply in one concern makes an attractive proposition. This tiny Lincolnshire gas undertaking has existed for close upon half-a-century in such a developing area that last year the sales of gas, so the records state, had reached the grand total of 2½ million c.ft., at 7s. 6d. per 1000 c.ft.! The concern has now come into the hands of these promoters; and they propose to extend the gas-works and to electrify the area. They contemplate the utilization of the coke produced by the carbonization of coal for generating electricity, which means that the "residual products" will be utilized on the gas-works site without cost of transport! From such interrelations and co-ordination, wonderful economies will accrue; but search is made in vain through the prospectus for figures as to the past or the prospects. We are entering pretty fully into this matter, because the time is ripe for the gas industry to hesitate no longer in cautioning its investors against these intriguing schemes. The four Directors are prepared to receive applications for new capital amounting to £5000 10 p.ct. preference shares at £1 2s. 6d., which (if applied for) would produce £5625; also for 1200 first mortgage 7 p.ct. debentures of £5 each, which would produce (all being issued) £6000—together £11,625. The Company have also 5000 ordinary shares of 5s. each, "all of which have been issued." These represent £1250; so that, with the premium on the preference shares, the total capital, if the issue is successful, would be £12,875. Ignoring the undeveloped proposals as to electricity and gas-works extensions, and dividing the capital by the 2½ million c.ft. sold in 1923, the capital in view is equal to £5150 per million c.ft.! We believe that is entitled "to take the biscuit." We willingly give the promoters credit for the possession of marvellous imaginations. A dividend of 10 p.ct. on £5000 preference shares would require £500, and 7 p.ct. on the debentures £420, together £920. The qualification of each Director is to be the holding (as sole or joint holder) of not less than ten shares. The ordinary shares being 5s., a 50s. investment would suffice for the qualification. The remuneration of the Directors "shall be" £100 per annum or such a sum as may be determined "by resolution of the Board." Excellent! With four Directors, £100 each would mean £400. If one of them is appointed Managing Director, he is to have £300 a year, *plus* any reasonable expenses. In that event £600 would be required for the Board. Where is the money for the investors coming from? The gas receipts last year could not have been much more than £900 at 7s. 6d. per 1000 c.ft., and at that price there is not a great chance for the use of gas for heating purposes. From the receipts for gas, secondary products, and rentals, all working and other expenses have to be deducted; and then provision has to be made for Directors' fees. We ask again, where is the money coming from to meet the dividend and interest.

We need say no more. The quality of this promotion is attested in large characters in this foolish prospectus. It is said by some that investors in the gas industry who put money into such schemes as this deserve all they get. It may be so in some cases—not by any means in all. Many

have become investors in gas undertakings owing solely to their good reputation, and their proved ability successfully to meet competition. Therefore they are prepossessed by gas enterprise as an investment; and without the ability or the means to examine into a new proposition presented to them in the form of the Navenby one, they may be tempted to invest in them. In our opinion, every gas undertaking in the country should send out a circular-letter cautioning its share and stock holders against investing in any gas undertaking of doubtful origin without thorough investigation or seeking advice from those in a position to give it. To frustrate the machinations of promoters whose schemes will not stand critical investigation by experts is work demanded from those who wish to maintain a healthy state for investment in the gas industry. These big capital-raising exploits in respect of little concerns do no good to the capital-raising resources of sound gas undertakings.

Society of British Gas Industries—Monetary Decimalization.

THE unity of the gas industry was, in more ways than one, again well expressed by the meeting of the Society of British Gas Industries last Wednesday; and it is this visible and outward manifestation of unity (which we of the industry all know full well is also deep-rooted) which causes our visitors to admire our organization, though some of us feel that there could yet be greater completeness by consolidation. Yet there is satisfaction in the condition of things as they exist, which satisfaction may some day be intensified. However, it is a significant attestation of the oneness of purpose of all organizations in the industry to have the President of the National Gas Council (Mr. D. Milne Watson) occupying the presidency of the Society; and he is proud of the position. The invitation to him to take the office is a recognition by the Society of the union of all parts of the industry and of their interdependence; and the acceptance of the office denotes how reciprocal is the feeling and the knowledge. But in addition to this, throughout the report of the Chairman of the Council of the Society (Mr. Wilfrid Drake) there is the evidence, repeated and emphasized, of collaboration in many ways between the suppliers of gas and the makers of gas plant and appliances. Not the least of the references to that collaboration is found in the mention in the report of the part taken by the members of the Society in the Gas Exhibit at the British Empire Exhibition. By the Council there was appreciation (as there has been by the whole industry) of the co-operation of the members in financing the exhibit, and in providing some of the latest examples of goods for the purpose of demonstration. It is pleasing to read: "Already there are signs that an in-" crease in business in gas appliances has resulted; and it " seems only fair to credit the exhibit with a large part of " this." This expresses the view that is prevalent almost wholly throughout the industry. There is extant a combination of circumstances favourable to the wider adoption of gas as a fuel; and the big exhibition came very opportunely for the gas industry.

> There is a tide in the affairs of men
> Which, taken at the flood, leads on to fortune.

And no means must be allowed to escape us in the present which will enable the industry to maintain the flowing tide to still greater popularity for gas. The Gas Exhibit has assisted in this in immeasurable degree. The makers of gas appliances know it; the makers of gas plant are aware that, as consumption increases, the day draws nearer in the case of each undertaking when producing, purifying, holder, and distributing capacity will need enlargement.

The central feature of the meeting was a paper by the Chairman of the Council entitled "Some Aspects of the Metric System." But actually the contribution dealt with only one aspect—the decimalization of our currency. It was a Drake who discovered America. He was a bold man. The Chairman of the Council is also a bold man; and he is a Drake. He has been to America and has discovered that the simplest plan—we may not all agree with him—is to be found in the application to our coinage of the American dollar and cent, because there would be less interference with the relative values between the new and our present currency, and therefore with the values of commodities. It is an intricate subject, and many are the proposals that have been put forward with the idea of bringing our coinage on to the decimal basis. But no plan has been accepted, and there are no present signs of this happening. Actually the advocates of the change are few; those who take no interest in the subject and are content are many. The fact suggests that major opinion is favourable to leaving our money denominations and their values as they are. There would be simplification by the adoption of the decimal system, but not without we scrapped our existing monetary denominations and values, and (as it were) started *de novo*. There is little question that Mr. Drake's idea of conversion to dollars and cents is as simple a plan as any, seeing that fundamentally 6d. would become 12c., a shilling 24c., and so on, by simply multiplying the pence in each coin by two. But what an ugly thing to have to describe a coin with a present single name by three words—such as, instead of a "shilling," twenty-four cents. The masses would not appreciate or like the change, particularly when they got to the higher values.

Mr. Drake says, "under my proposals, in this country it would be exceptionally easy to remember whole numbers"—such as 10s. would become \$2·40; £1, \$4·80; £1 10s., \$7·20; and so on. It may appear easy to Mr. Drake, but it would not be so to a very large percentage of the people. The salesman who asked a customer for \$16·92 for a gas-fire would find him scratching his head trying to come to a conclusion, by reference to the old currency, as to whether it was dear or cheap; and \$16·92 appears to be much more formidable than £3 10s. 6d. Still Mr. Drake believes it is easier to think in new terms than in new values, such as would be the case under other proposals for conversion to the decimal system of coinage. He also supposes that, when changing-over, we should all have a simple little table available for reference. We try to vision the customers in a big shopping centre walking about with the "simple little table" in the hand to ascertain whether or not he or she is paying more or less than in the old days before being called upon to deal in dollars and cents. Mr. Drake is in a business with big transactions, and those with whom he makes contracts are business men accustomed to considerable financial transactions. He has nothing to do with the retail side of business where the chief trouble would be. An interesting explanation ought to be forthcoming from him as to how the gas industry should convert its 4½ million prepayment meters to the cent system. Anticipation of that interest is sharpened when we see that in addition to dollar bills he proposes 5, 10, 25, and 50 c. pieces, but so designed and minted as to prevent confusion with our existing coinage. They would therefore be of no use for the present coin mechanism. It was an interesting paper and discussion; but we are not yet persuaded that the advantages of the change would outweigh the disadvantages of uprooting and destroying our monetary system. Mr. Drake does not mind people disagreeing with him. He admits the complexity of the subject, and that it is only by discussion that the advantages and disadvantages can be brought into proper perspective, and a right decision be reached.

The Science of Distribution.

THE changed conditions of gas demand and of the circumstances of road use have necessitated an altogether new outlook in respect of the design of distribution systems. The changes have been gradually creeping over the areas of gas supply, until cumulatively they have brought things to a completely different order from those which obtained even (say) a quarter of a century ago. Efficiency in provision for gas conveyance and delivery, and economy in the work in roadways, are of far greater importance than they were. This is an effect of development in the conveniences of communal life, among which gas is not the least. Some of the results to gas distribution engineering are found in the paper which Mr. B. Henderson, of the Walker and Wallsend Union Gas Company, read at the recent auxiliary meeting of the North of England Gas Managers' Association, as printed in this issue of the "JOURNAL." The contribution was full of points relating to modern practice in this industrial district. Not only in that area but in all others, gas has become a necessity at all hours of the day, and the demand created results in somewhat violent fluctuations according to work, local custom, and weather influences.

It is impossible here to notice all the points of Mr.

Henderson's excellent account of experiences; but attention may be called to a few of the practices which conditions, experience, and experiment have brought into being. An important one is that, as far as possible, all the mains in the district are laid on the arterial or circuited system. This has several advantages, including increased capacity, equalization of pressure, and no cessation of supply during the time occupied in making new connections and repairs—all of which advantages are of intrinsic value in these days of continual but quantitatively oscillating demand. With such circuited mains, a local stoppage does not cause a discontinuance of supply to the consumers. This point should be particularly studied, as reliability of supply is the pride of the gas man, and unreliability the nightmare of the electrical man. The maintenance of pressure, too, at a practical level for realizing efficiency in use is not only a legal obligation under the Gas Regulation Act, but a condition of material commercial importance. Looking to present convenience and probable future developments, the practice now is to lay mains under the footpaths in new streets and in old streets when resurfaced on modern lines. Some engineers find objection to this in the higher initial cost; but the higher initial expenditure is a financial economy for the future, inasmuch as it lessens the expense of road work, shortens the length of service (which reduces the work involved), and lowers the maintenance charges. When a new main is being laid into an area in which development is taking place, an attempt is made to forecast not only the probable increase of demand, but the probable further building expansion in the district.

A valuable power enjoyed by the Company through their Act of 1903 is that of specifying the size and material of services, with the right of inspection before the pipes are covered up, and refusal to supply if there are any defects. Mr. Henderson is properly of opinion that this power should be possessed by every gas undertaking. We should prefer to see the power extended beyond the service to the piping throughout a building. Another practice of the Company is to fix a stopcock on the service in the footpath. This, we suggest, is a somewhat expensive proceeding, though valuable in the case of an escape or fire. Escapes, however, on premises are likely to be rare with periodical inspection. The stopcock would undoubtedly be useful for clearing purposes on a service supplying more than one meter. Easy and absolute stoppage in case of unpaid accounts is another suggested advantage of outside service stopcocks; but we hope that in Walker and Wallsend this is not really a substantial reason in their favour. Fire is the most important reason for the adoption of such stopcocks; but the question is, Is this a sufficient justification for a pavement stopcock on every service? Then various methods have been employed in the Company's area for the preservation of service-pipes; and choice has lately fallen on Staffordshire puddled iron pipes of steam quality, coated by a cold bitumastic solution, and covered with Hessian cloth, also coated —particular care being taken over the coating and covering where a socket is used. The greatest trouble with pipes appears to be in ground where there has been use of boiler ashes, the acids from which attack the pipes. Practices as to the protection of service pipes vary in different districts, and what may not be the best for Walker and Wallsend may be found excellent in other areas. Very much depends on the character of the sub-soil.

Another practical suggestion should be noted; and it is that in industrial establishments where large meters have been used for the supply, and electricity is substituted—gas being retained only for small purposes—the meter should be changed for a smaller one. This would naturally be done where the meter is the property of the gas undertaking, unless the consumer particularly desires its retention as a stand-by, and pays the necessary charges. Even then there is the danger of small quantities of gas being used and not being registered—for example, for one or two burners. Experience of a case of this kind is related in the paper, where two bunsen burners only were employed (after the adoption of electricity), and a private 300-light meter did not register the consumption. On a 10-light meter being fixed, the registration was about 6000 c.ft. per month. Another point is that Mr. Henderson considers it would have been an advantage, where compressed air is used with gas, had the insertion of a non-return valve on the outlet of all meters been made compulsory. As a contribution to distribution experiences and practices, the paper is highly interesting and suggestive.

The Commercial Advance of Gas Coke.

GAS COKE is winning greater way into use, and through its own virtues. This condition has not been brought about without, on the one hand, quiet persistent propaganda and effort, and, on the other, greater attention than was at one time given to the condition of the coke in respect of grading, moisture, and ash, the last-named through the purchase of coal of lower ash content for gas making. We are inclined to think that the credit for its more extended use cannot be accorded to any imposing feeling for national interests in the matter of coal conservation, or because it has good effect in assisting in the prevention of the pollution of the air by smoke. These are advantages of no mean order; but they must be taken as more or less incidental to the real incentives to the use of gas coke, which incentives are of the material order, and arise from economy and efficiency. Direct economy and efficiency are stronger animating forces with the individual than coal conservation or the deterioration of the atmosphere by smoke, which nevertheless produces endless uneconomies and depreciates individual and collective efficiency. Although at the recent Smoke Abatement Conference there was much advocacy of gas coke as a fuel—advocacy such as we know so well—the greatest impression made upon us by the contributions, prepared or extempore, is the satisfactory progress that the material has made as a fuel. As we look back for the purpose of comparison, the satisfaction regarding progress is increased, for the once despised is now the accepted, owing to improved quality, grading, and knowledge as to how to use the fuel. Science has been busy in this direction, and has demonstrated, until practice is now considerable, that a fuel of such characteristics desires proper application in order to develop its virtues. When this is done, then it requires no waste of volatile matter through allowing it to remain in undue quantity in the coke, nor the adoption of special plant for the purpose of its production.

The advance that has been made in the utilization of gas coke was perhaps best portrayed in the paper by Mr. E. W. L. Nicol, though Dr. E. W. Smith and others showed, perhaps more pointedly, its growing application for domestic heating. But in one particular, Mr. Nicol supplied a striking illustration of progress in its use for domestic water heating. It is worth while to give prominence to his illustration. It related to coke-fired hot water supply boilers. When he is able to tell us that one maker alone is sending out these boilers at the rate of 4800 per annum, this is significant of the growing demand there is for them. The sales of this one maker (and there are forty firms producing such boilers) represent an increment in the demand for coke of 24,000 tons per annum. Reckoning that double this quantity of coal is carbonized in its production, it means that, in addition to the smokeless coke, no less than 625 million c.ft. of gas are made, which also has a market in lieu of coal. It is easily demonstrable that the 48,000 tons of coal is put to better service than it could be by any other means of utilization, and to the national advantage. That is only one example. The same thing could be shown with greater emphasis were data available as to the total application of gas coke for any one domestic purpose. Beneficial effects of a like order, from the points of view of economy, efficiency, coal conservation, and smoke abatement, can be shown by reference to the extension of the use of gas coke in industry. It is no longer abused and rejected as an inferior fuel, except where there is crass ignorance. The engineering industry has been literally pelted with data as to the wonderful efficiency that can be obtained by pulverized fuel, with its uncomfortable (for the neighbourhood) emissions from boiler-house shafts, which demand special precautions and arrangements to trap the nuisance. The information is spreading, through the daily practical exemplification of the truth, that there is at hand a fuel which, without going through all the performance and expense of pulverization, can give an equal economy, and that without nuisance, while at the same time admitting of the use of low-grade coals which can be had at a cheap rate. We are not quite sure that the coal-mining industry has yet fully opened its eyes to the fact that in gas-coke it has an effective ally in the creation of a market for low-grade varieties of coal which have hitherto been rather a burden. It is an ally both to the coal industry and to the industrialists who adopt it for the purpose of enabling them to use cheap classes of coal. The "Sandwich" (patented) system of application is the one that has proved in steam-boiler fires the most economically advantageous from all

points of view. When one uses a low-grade coal containing only 28 p.ct. of volatile matter and a coke containing only 1 p.ct. (2 to 3 p.ct. is usual), in the proportion of 50 p.ct. of each, the volatile matter in the composite fuel bed is reduced to 14·5 p.ct. Combined with that, better combustion is promoted; and this, with the reduced volatile content, accounts for the contribution to smoke prevention. That, however, is only an incidental advantage to the main one that the industrialist seeks, and that is economy.

Every fresh set of data published confirms the preceding ones in this regard. In this paper there is a tabulated statement as to a recent test; and throughout it there is consistency in the tale of advantage from using coke with coal. With the composite fuel, the water evaporated per sq. ft. of heating surface was 5·22 lbs., as compared with 4·35 lbs. with coal alone; per pound of fuel, the figures as to water evaporated were respectively 7·18 lbs. and 5·76 lbs. With the mixture, the efficiency of the boiler and superheater was 69·9 p.ct.; with coal alone, 53·12 p.ct. The efficiency of the boiler with economizer was 79·96 p.ct.; with coal alone, 60·98 p.ct. The output of steam per boiler was greater by 20 p.ct. And all this with a mixed fuel having a calorific value of 11,138 B.Th.U., compared with 12,150 B.Th.U. for coal alone. It is such results, which are consistently obtained owing to the improved fuel bed and combustion, that have had a persuasive influence upon power station engineers. There is, in fact, no escaping their significance. When we know what has long been done in large power stations in London and elsewhere, it is not surprising that the new Barton power station of the Manchester Corporation is fitted up on the Sandwich system for boiler feeding; and it is also not astonishing that in consequence it ranks for efficiency at the top of its group in the Electricity Commissioner's report. And passing to Darlington for further illustration, we have coke breeze being burned with coal on the Sandwich system; and, with a load factor of only 25·6 p.ct., the cost of fuel per unit sold—0·34d.—is the lowest recorded this year for any undertaking in the country. Experience is presenting a solid case for a better co-ordination in the use of coal, with substantial economic results for the community at large.

Parliament.

Parliament will meet on the 2nd prox. for the election of the Speaker, and the swearing-in of members. The State opening will be on Dec. 8 or 9; and on Dec. 17 or 18 there will be an adjournment until February.

Fixing Geysers to Water-Mains.

The Metropolitan Water Board are still obdurate regarding the fixing of geysers direct to water-mains. The National Gas Council and their Solicitor have therefore in consultation prepared a request to the Board to amend their regulations. This document has to be signed by ten users of water in the area of the gas undertakings affected. Thereafter it will be served on the Water Board. It is to be hoped that this will end the difficulty, for which there is no justifiable reason

The Ladies Take a Hand.

Women are to take a hand in the development of the electricity industry on the domestic side. What is known as the Women's Electrical Association has been inaugurated. It has for its object the "interesting of women in electrical development in this country." The organization was launched, it is learned, at a meeting at the London house of the Hon. Lady Parsons, which was attended by representative men and women electricians, members of women's housing councils and of various other women's organizations, health and welfare workers, and of working-class women. It has been decided that the Association shall consist, roughly, of three sections, comprising housewives of all classes of society, representatives of public services, and women engineers. Demonstrations of existing electrical apparatus and "simple" lectures will be given in connection with social afternoons. It is also proposed to form a juvenile section. The Director of the Electrical Development Association (Mr. J. W. Beauchamp) has promised support to the new organization and encouragement of a practical nature. This, we take it, is an outcome of the difficulties experienced in making any striking advance in domestic electrification, in view of the fact that there is another labour-saving agent in the field, possessing the commendable features of higher economy and efficiency.

A Second Wembley Year.

The announcement of the Prime Minister that the British Empire Exhibition will have a second edition next year shows that Mr. Baldwin "takes the long view that the lessons learned by the first Empire Exhibition should be pursued, and that the British Government should lead the way with a sufficient guarantee." Those words are quoted from an article which Sir Robert Donald, Chairman of the Publicity Council of the Exhibition, has contributed to the "Daily Telegraph." The article is strongly in favour of a continuation of the exhibition in 1925 on various grounds—financial on the one hand, and on the other because, gratifying as has been the success of the exhibition as a demonstration of our wealth in natural resources and in industrial power, and still more as a means of empire education, the lessons which it was intended to drive home were not complete—its mission was not finished. The undertaking cost more than 20 millions sterling to create. The lay-out of the site and the underground works—including water, gas, and electric mains—cost about three quarters of a million. The excess over the estimates of the Palaces of Industry and Engineering, which together cost quite £800,000, was considerable; and these are magnificent permanent buildings. With all the vast expenditure on this grand setting for the exhibition, the chief handicap it had to fight against was "the rainiest season on record." If in such circumstances over 17 million people were attracted to Wembley the first year, when the initial great co-operative Empire push stirred the imagination, Sir Robert asks how many will be attracted by a second edition? It cannot be supposed that next year will be so bad as the present one, when the conditions of the weather prevented a multitude of people beyond the 17 millions from paying a visit. All things considered, it is thought that the vast expenditure incurred in making preparation should not be allowed to lie dormant, but that another season should be given to enable the capital to yield a return. Sir Robert emphatically says that from a business point of view the exhibition has been a success. The renters of space have had a good return. The concessionaires have done well. The exhibitors have opened up new markets, and prepared the way for fresh developments. By the grouping system, the British exhibitors have realized the advantages of co-operative action.

Ramsay Chemical Engineering Laboratory.

Memorials to great men and their work in these times take a more useful and practical form than was the custom a couple of decades ago. We have an example of this in what the gas industry did at Leeds University. Another instance in which the industry has very intimate interest is the memorial to Sir William Ramsay, at University College, the final act in the establishment of which was performed last week by Prince Arthur of Connaught. The memorial has taken two main forms—the foundation of the Ramsay Memorial Fellowship in Chemical Science, and the foundation of a Ramsay laboratory of chemical engineering. The Ramsay Memorial Fellowship Trust are already administering sixteen scholarships held by carefully selected fellows from this and other countries. As to the laboratory, for the first five years the college authorities have deemed it best to use the present buildings, which have been specially adapted and equipped for the purpose, and to defer until later the erection of new laboratories so as to gain experience as to the soundest and most useful lines upon which to design the new buildings. Another point of interest is that an old friend of the gas industry—Prof. E. C. Williams—went from Leeds University to become, at University College, Ramsay Professor of Chemical Engineering. It was under his guidance that the laboratories have been reconstructed and equipped.

Electricians' Wages.

The protracted dispute over the claim for an increase of 10s. per week in wages for all grades of workers in the electricity industry has now been settled. It will be remembered that a Special Tribunal who inquired into the matter reported that no case had been made out for the granting of the all-round advance asked for. But the main recommendation of the Tribunal was that the Regional Councils should be asked to reconsider the existing

rates of pay, having regard to the prosperity of the industry in the areas and the special reductions effected in 1922 and 1923. When the matter came before the National Joint Council for the Electrical Industry last Friday, the men's representatives declined to accept the view of the Tribunal that no case had been made out; but both sides affirmed the main recommendation. This removes the stumbling-block of an all-grades advance on a national basis, and opens out negotiations in the various districts on the basis suggested by the Special Tribunal. The Unions will therefore now limit their activities to those areas in which they consider there is a case justifying a wage claim. Only in the event of failure by any of the Regional Councils will the National Council be again troubled with the matter.

PERSONAL.

We learn that Mr. A. R. BURCH, the General Manager of the Bombay Gas Company, Ltd., has retired owing to illness. He has our sympathy and best wishes for a quick re-establishment of health by rest in the homeland.

Mr. G. P. MITCHELL, the Blackburn Corporation Gas Engineer, was initiated an honorary member of the Greenbank Lodge of Oddfellows, Blackburn, by the Grand Master of the Manchester Unity, Bro. Brimblecombe, of Exeter.

The Birmingham City Council have re-appointed Alderman J. H. LLOYD Chairman of the Gas Committee for the ensuing year. He is a member of the firm of Messrs. Stewarts & Lloyds, and has presided over the Gas Committee for many years.

Prof. J. W. HINCHLEY (who took a leading part in the formation of the Institution of Chemical Engineers, of which body he is now Hon. Secretary) recently underwent an operation for appendicitis. We are glad to learn that he is making satisfactory progress.

Mr. KENNETH AIRD, Managing Director of Messrs. R. & A Main, Ltd., who has been resident in Scotland for a number of years, has now taken up residence in London. His headquarters for the future will be at the London office of Messrs. R. & A. Main, Ltd., No. 38, Grosvenor Gardens, S.W. 1.

Mr. J. H. RACE, who has been a member of the chemical staff of the Liverpool Gas Company for the past three years, has been appointed Works Chemist to the Bishop Auckland Gas Company.

Mr. THOMAS W. JORDAN, Managing Director of the Manchester Paint and Varnish Company, Ltd., of Ancoats Vale, Manchester, is at present in a nursing home, having undergone a rather serious operation. His friends will, however, be glad to learn that he is now progressing well towards recovery.

The deep sympathy of the numerous friends of Mr. CHARLES B. NEWTON, M.Inst.C.E. (Water and Gas Engineer of the City of Hull), will be extended to him in the loss he has recently sustained by the death of his wife. Mrs. Newton was a native of Shrewsbury, at which town the interment took place on Tuesday, the 4th inst. She was well known to many of the older engineers, and in local affairs she enjoyed the affection and regard of a wide circle of friends through her many activities in parochial and other matters. Mrs. Newton leaves one son and two daughters.

ELECTRICITY SUPPLY MEMORANDA.

An Election Circular.

A LITTLE mustard-coloured circular, which could be obtained for 5s. per 1000 copies, was used by the Labour-Socialist candidates in the recent General Election. The publishers are the Independent Labour Party. Towards the bottom of the circular it is written: "Electricity as the handmaiden of the housewife transforms the home. If you [with an emphasis on the 'you'] want this, vote Labour." The results of the election show that the people do not want this; and this is emphasized by the reduced number of parliamentary representatives of the Socialist order. They do not desire the big electricity schemes, nationalization, or anything else which will interfere with a well-ordered line of progress. The circular says more than one unkind thing about electricity, and is quite generous to gas. To the management of the electricity industry Labour manifestly accords a very low appraisement, just about as low as the value put by the miners upon the administration of the coal-mining industry. The circular is addressed to the housewife. She is asked, "Do you want freedom from drudgery and dirt? Household electricity is the key. Lay it on in every home, and use it as freely as gas." That advice will not do, inasmuch as in the next lines it is admitted that electricity is dear, and reasons are given as to why it is so. This is how the circular puts it: "You say: 'It is too dear.' Why is it dear? Because it is wastefully produced, on too small a scale, and largely controlled by Trusts, whose main object is private profits" [the last two words in capital letters]. In the eyes of Labour, those who direct the electricity industry are a bad lot. The Independent Labour Party think they have a greater knowledge of how to produce cheap electricity than those who have had life-long experience of the work. They emphatically say that "electricity could be produced and sold as freely and cheaply as gas." That is a compliment to gas; but we deny the assertion. "How can this be done?" And the airy reply comes: "By producing it in great regional power stations owned by the nation, and distributing it under the control of the local authority." This shows how much Labour knows about the matter. They have little cognizance as to the limits of fuel economy in generation having been just about reached; nor are they aware of the weight of transmission costs and losses. "Cheap and plentiful electricity in your home means electric heating, cooking, ironing, washing, sewing." The ultimate in commercial cheapness, as the best of intelligences in these matters could tell Labour, would not for the masses mean cheap heating and cooking, with only about 8 p.ct. of the heat value of coal obtained in the form of electricity. Experience would lead to a prompt return to coal or gas. Those mustard-coloured circulars were dear at 5s. per 1000; for there was little on them that did not constitute misinformation.

For the Regulations.

After the explosive escapade of Mr. L. L. Robinson regarding the new wiring regulations of the Institution of Electrical Engineers, it is refreshing to have a defence of them from someone with the capacity for looking beneath as well as upon their surface—although that "someone" prefers to write anonymously by signing himself "Electricity in Circuits." There is a good dose of cynicism in the opening paragraph of this gentleman's letter, which Mr. Robinson will have some difficulty in swallowing. It says that "to Mr. Robinson—looking down from the pinnacle of Hackney achievements—the concerted efforts of representatives of the industry in the remainder of Great Britain appear to be unduly small." The fact of the matter is that the chief at Hackney, by his remarkable effusions, is (if we may judge from published material) causing more amusement in the electricity supply industry than anything else. "Electricity in Circuits" is able to boil down the regulations to a comparatively few fundamental requirements. These are: "(1) The protection of the installation from ordinary risks of mechanical damage. (2) The protection of the installation from known causes of rapid deterioration. (3) The provision of a sufficient amount of insulating material for it to function as such. (4) Adequate precautions for preventing any metal liable to be touched from becoming alive, and for preventing the inadvertent handling of live parts. (5) Precautions against fire risks and burns." There can be no quarrel over that statement; the requirements being all reasonable. Without them the writer of the letter says that the gas industry would be able to make as much capital out of the dangers of electricity as Mr. Robinson makes out of the dangers of gas; and he suggests that the dangers of gas could be largely eliminated by regulations as to types of joints and taps. We thank him. "Electricity in Circuits" has a very good opinion of the people. His experience is that a user of electricity is never inclined to sacrifice to price the quality of his wiring. Such experience is fortunate and interesting. It is a contradiction of all the statements that have been published as to the householder going to the cheapest market for his wiring and goods, and that this disposition is the cause of the nasty and dangerous installations that are fairly prevalent. Observance of the regulations would protect both the user of electricity and (from unfair competition) the conscientious contractor.

The Unaccepted Challenge.

Allusion has been made two or three times in the "Memoranda" to the challenge by Mr. Sam Hall, of Leith, to Mr. L. L. Robinson to have a public test of the over-all economies of gas and electric cookers under equal conditions of work. It will be remembered that Mr. Robinson has not accepted the invitation, but in its place he shows the extent of his courage in the matter by holding up for admiration a book of testimonials. This naturally is unsatisfactory to Mr. Hall. In a further letter to the "Electrical Review," he states that "he has read Mr. Robinson's replies to his communications." He does not say whether he has read them with interest or with a smile. We venture the view that the interest and the smile have been combined. He refers Mr. Robinson to a sentence in a previous letter to the "Review": "By having a public test carried out, we will arrive at some definite conclusion which cannot possibly be obtained through the columns of your journal." Mr. Hall states that he still adheres to this; and adds: "Surely if Mr. Robinson believes that his product is as good or even better than gas, he would be giving the vendors of electrical appliances and producers of 'juice' a boost-up by accepting the challenge, and proving once and for all the true facts." That is not the finish. If Mr. Robinson continues to beat a retreat instead of being willing to make an advance, Mr. Hall is willing to meet any other person who will accept his challenge. But he declines to proceed with the correspondence, other than to discuss details as to the lines to be pursued in carrying out a test. Mr. Hall wants business—not talk, or hackneyed testimonials.

Electric Cooking and the Poor Man.

In "Electric Cooking and Heating Notes" in the "Electrical Times," we see an example of the curious twist of imagination that some electrical men have when dealing with the cooking requirements of the "poor man." The article is headed "Electric Cooking and the Poor Man"—who would be poorer still if he adopted the advice tendered to him by our elec-

trical contemporary. The writer shows that he has a very shallow acquaintance with the "poor man's" requirements. The gas industry has an unrivalled experience of them through its 4½ million prepayment consumers. In two-and-a-half to three hours on Sunday, gasholders filled to the top plates sink to low level through the cooking of the Sunday dinner, for which meal a joint and other food is cooked in the oven. That short space of time usually sees the peak of the weekly load for a gas-works, other than perhaps on cold foggy days, or in especially busy industrial areas. During the remainder of the week, cooking is largely by boiling and frying, and so the hotplate is the part of the cooker very commonly used on six days of the week. If this largely confirmed experience is considered by the writer in our contemporary, he will quickly discern why it is that electric cooking would not be economical for the "poor man," though he claims in his article that it would be, and gives reasons in support, which (also from experience) we know are untenable. Let us examine them. He says electric cooking shows to the best advantage in the homes of the workers. How he knows this is not explained. But this is his reason for so believing: "Electric cooking involves the application of heat in what may be termed concentrated form. *Waste, in the circumstances, if it occurs at all, does so at a high rate.* For maximum economy waste must be reduced to the minimum." Naturally! This condition, he thinks, is best secured if the operator is personally interested in promoting economy; and then we have this: "The present-day servant, to put it mildly, is less prone to be careful." "The present-day servant" is the future wife of the working man; and she is the person who is "less prone to be careful." Her conversion from the state of servant to that of housewife does not always alter her habits. Again we have knowledge of this through the prepayment meter system; and were not the thermal units supplied by gas so much cheaper than those from electricity, the cost of the waste through carelessness on even the gas-cooker hotplate would in many cases be great. What it would be with the hotplates of the electric cooker—seeing that in the working man's house the hotplate is utilized almost continually—we dare not think. It is untrue of the writer in our contemporary to say that "with the elimination of unnecessary waste, it (the electric cooker) is the cheapest as well as the best method of cooking." The writer thinks that consideration of "these factors" (which are wanting in substance) confirms that it is among the middle and poorer classes of the community that the most promising field for the development of electric cooking exists. Some men are very prone to deceive themselves. To stir up electrical managements to cultivate this class of consumer, the writer of "Cooking and Heating Notes" also points out that they represent the least remunerative class of lighting customer—in some cases there is good reason to believe that individuals are actually supplied at a loss. By converting such customers to electric cooking, they would become really remunerative. That is about the only statement in the article with which we can agree.

The Weekly Toll.

The "Electrical Review" is honest. It may (through a slip of the memory or of the pen) proclaim the "safety" of electricity. But hardly a week passes without a paragraph appears in its columns, side-headed "Fatalities." In one issue recently three inquests were noticed under the heading. One was in regard to the death of a boy named Laurence Turner. The evidence of a companion was that he heard Turner cry out, and he saw that he had a wire in his hand which carried current to a garage. Before he could reach him, deceased made a second exclamation, and fell dead. This companion had made the extension to the garage. An expert witness stated that the insulation of part of the wire had perished, which allowed the lead sheath to come into contact with the conductors. The voltage was 230, and the wire had not been earthed, as should have been the case. This shows that the facility of making electrical connections is a danger where inexperienced persons are concerned. Then Samuel Gibson, a trailer, was lately killed at a colliery at Maryport. With a fellow worker, he was trying to hoist a full tub, and to steady himself gripped the electric cable. After the accident it was discovered that there was a cut in the cable. The third case noticed by our contemporary was the one attributed to Hackney in the "Memoranda" last week. Just recently "Meteor," of the "Electrical Times," foolishly asserted in a reference to gas that people were "killed like flies!" Regarding the third case mentioned, the Electrical Engineer of Hackney (Mr. L. L. Robinson) writes: "There has been no accident whatsoever in the Hackney district, nor do we supply current at 220 volts alternating. Our supply is entirely by direct current at 240 volts for lighting and 480 volts for power." This is how the "Electrical Review" reports the matter: "An inquest was held on Nov. 3 at Hackney on the body of W. H. Banks (aged 39), of Tollington Park, who died from heart failure as the result of an electric shock. The Coroner (Dr. Edwin Smith), in returning a verdict of 'Accidental Death,' laid stress on the importance of trying artificial respiration in such cases." Perhaps Mr. Robinson knows where the accident did occur; and it would have been of interest had he given the information in his letter to us.

Yorkshire Junior Gas Association.—The report of the meeting held last Saturday at Bradford, at which Mr. E. Gillett delivered his presidential address, is unavoidably held over till next week's issue of the "JOURNAL."

SUTTON'S VOLUMETRIC ANALYSIS.*

This well-known work made its first appearance sixty-one years ago, and since that time has been in constant use in chemical laboratories. The Eleventh Edition, now issued, will be cordially welcomed, as the preceding one, which was published so long ago as 1911, has been out of print and unobtainable for some time. The author's son, Mr. W. L. Sutton, and Mr. A. E. Johnson have acted as Joint Editors, and the section on gas analysis, which has been entirely rewritten, has been contributed by Mr. H. Hollings, M.Sc., and Dr. J. S. G. Thomas, who are both well known in the gas industry. The book is divided into eight parts, with an appendix of tables.

Part 1 deals with the general principles of volumetric analysis, along with a description of the necessary apparatus, and methods of calibration; the "limits of error" allowed by the National Physical Laboratory are also included.

Part 2 is concerned with acidimetry and alkalimetry, and includes notes on indicators, and methods for the complete technical analysis of ammoniacal liquors, based on the Reports of the Chief Inspector of Alkali Works.

Part 3 deals on the usual lines with analysis by oxidation and reduction.

Part 4 gives details of the use of a solution of silver nitrate.

Part 5, which is the longest in the book, and occupies some 200 pages, records methods for the analysis of various inorganic compounds, commencing with those of aluminium and ending with zinc.

Part 6 deals with the examination of certain organic substances such as acetone, glycerine, butter, sugar, &c.

Part 7 is devoted to urine.

Part 8 records in detail methods for the analysis of natural waters and sewage, and includes a table of typical analyses of many of the public water supplies of this country.

Part 9, which deals with gas analysis, has been entirely rewritten and brought up to date. It contains an account of methods of sampling, calibration of apparatus, and methods of analysis, including fractional combustion and direct determination of nitrogen. Simple forms of apparatus such as those of Orsat-Lunge and Hempel are fully described, as well as the more complicated and exact forms associated with the names of Bone and Wheeler, Sodeau, Haldane, &c. Special attention is devoted to the examination of coal gas, and to the detection and estimation of very small amounts of certain constituents in gaseous mixtures.

A goodly number of errors and slips has been noticed—*e.g.*, 1153 for 115·3 (p. 49); the formulæ for aniline and acetanilide (p. 97); the reference to the J.Amer.Chem.Soc. (p. 98); the last equation (p. 138); $CeCl_3$ for $CeCl_3$ (p. 181); iodide for iodate (p. 234); the formulæ for the phosphates of uranium (p. 307) are not those usually accepted, apart from the use of the symbol Ur for U; the equation representing the action of $K_2S_2O_8$ as an oxidizing agent is incorrectly given (p. 342); the product obtained by the action of Zn on $NaHSO_3$ is usually considered to be $Na_2S_2O_4$, sodium hydrosulphite, and not Na_2SO_2, sodium hyposulphite (p. 469), &c.

Modern nomenclature has not been uniformly adopted; thus on numerous occasions the expressions *hydrate* and *hydroxide* are used as alternatives; *strong* hydrochloric acid frequently appears where *concentrated* hydrochloric acid is implied, and on p. 93 there occurs the anomaly *strong* acetic acid; substances like KCNS are termed *thiocyanates* (p. 151), *sulphocyanides* (p. 222), or *sulphocyanates* (p. 349). Such expressions as *potass* (p. 107), *potassic hydric* fluoride (p. 117), *ammonic* cyanide (p. 207), *protosalt* (p. 345), *peroxidation* of ferrous salt (p. 187), acetic acid *strikes well* (p. 34), and *pentinormal* (p. 29) are somewhat unusual. In consideration of the limitation of the accuracy of ordinary burette readings, the desirability of using so many decimal places in recording factors and values is very questionable; at any rate the practice adopted might be more uniform—*e.g.*, on p. 115 it is stated that 1 c.c. of normal alkali is equivalent to 0·15 gramme of tartaric acid, and to 0·070027 gramme of citric acid on p. 114.

The particular section which will be of greatest interest to readers of the "JOURNAL" is that devoted to gas analysis. This has been entirely rewritten, and is particularly good. In addition to an account of the older and better-known methods, there are collected, and brought together in concise form, the results of a great deal of recent work and investigation having reference to the best methods for the accurate determination of certain constituents present in a gaseous mixture. A useful table of physical constants is included, as well as a special index to this section.

In a future edition the rewriting of certain other parts also might be seriously considered with a view to bringing the work more up to date. The omission of processes which are now little used might afford space for some reference to modern developments—*e.g.*, p_H values, and electrometric titration.

The book is well printed, and the illustrations are clear. References to many recent papers are included, and it is packed with information which will make it, as in the past, a valuable aid to those engaged in chemical laboratories.

W. LOWSON.

* "A Systematic Handbook of Volumetric Analysis," by Francis Sutton. Eleventh Edition, revised by W. Lincoln Sutton and A. E. Johnsen. London: J. & A. Churchill, 1924. Pp. xii. + 629. Price, 35s. net.

THE SMITHELLS FUND.

We hear from Prof. J. W. Cobb, C.B.E., B.Sc., of Leeds University, that there is being sent out to the subscribers to the Smithells Fund the following circular letter. He adds that the attendance of readers of the "JOURNAL" on the occasion referred to therein would be welcomed.

DEAR SIR (or MADAM),—As a subscriber, you will be pleased to learn that the movement which was started through the University of Leeds for raising a fund with the object of signalizing the distinguished services of Prof. Arthur Smithells, has been attended with complete success.

The fund has been generously supported by the colleagues of Prof. Smithells on the Council and staff of the University, personal friends, students from all parts of the world, and by those connected with industries who have desired to express in this practical way their appreciation of his sympathetic attitude and valuable assistance. The total amount of the fund is £2462 6s. 11d., of which it may be mentioned in acknowledgment that £1137—approximately one-half—was subscribed by the gas industry.

The commission to paint a portrait of Prof. Smithells for presentation to the University was placed with Mr. Fiddes Watt, R.A., and it is also proposed that Prof. Smithells shall be asked to accept a photographic reproduction of the portrait. When this and other incidental expenses have been met, a sum will be available for establishing, in the name of Prof. Smithells and on his advice, a scholarship of approximately £100 per annum within the University.

The final meeting of the Committee was held on Friday, Nov. 7, and it was decided:

(*a*) That a letter should be sent to all subscribers reporting upon the amount raised and the action taken.

(*b*) That the winding-up of the fund and the final arrangements with the University for the scholarship should be left with the signatories of the appeal and of this letter.

It was also decided that the presentation of the portrait to the University should be made in the Great Hall at 5 p.m. on Tuesday, Nov. 25, when Prof. Smithells and the artist, Mr. Fiddes Watt, are expected to be present. All subscribers are invited to the ceremony, and it is hoped that you will be able to attend.

For the Committee:

E. G. ARNOLD (Pro-Chancellor of the University), Chairman.
A. G. LUPTON, Treasurer.
J. W. COBB,
J. H. PRIESTLEY, } Joint Secretaries.

NATIONAL GAS COUNCIL.

Central Executive Board Meeting.

The Central Executive Board of the National Gas Council met on Tuesday, the 11th inst., at No. 28, Grosvenor Gardens, S.W. —Mr. D. MILNE WATSON in the Chair.

OIL PAINTING OF WILLIAM MURDOCH.

The Chairman reported that Mr. H. E. Jones had very kindly presented the National Gas Council with a genuine early portrait in oils of William Murdoch. The Secretary was instructed to convey to Mr. Jones the Council's appreciation of the gift; and it was arranged that the portrait should be given a place in the Board Room.

BOARD OF TRADE INQUIRY INTO BRITISH TRADE AND INDUSTRY.

A communication was reported from the Secretary of the Committee of the Board of Trade to inquire into British Trade and Industry, stating that the assistance of the Council by giving evidence before the Committee would be appreciated, and asking that the Council would outline the points on which they proposed to submit evidence.

DISQUALIFICATION OF DIRECTORS OF COMPANIES AS MEMBERS OF LOCAL AUTHORITIES.

The result of the appeal from Mr. Justice Bailhache's decision, and the effect of the same were reported.

ASSESSMENT OF GAS UNDERTAKINGS.

It was reported that the Council had taken Counsel's opinion upon a new proposal which had been made in the case of certain gas undertakings with regard to arriving at the figure to form the basis of assessment. The opinion of Counsel is very definite that the long-established pre-war practice of valuing gas undertakings would be upheld by the Courts to-day, whatever the result. That is to say, the Courts would not condemn the use of such practice because under present conditions it produced a small or no rateable value.

RATING OF MACHINERY.

It was reported that Mr. William Cash, F.C.A., had submitted evidence on the 6th inst. on behalf of the Council before the Rating of Machinery Committee set up by the Ministry of Health.

TRADERS' CO-ORDINATING COMMITTEE OF THE FEDERATION OF BRITISH INDUSTRIES.

Mr. S. S. Ogilvie was appointed to represent the Council on the above Committee.

ROAD TAR SURFACES AND RIVER POLLUTION.

The publication of a "Report of Proceedings under the Salmon and Freshwater Fisheries Acts, for 1922 and 1923, on River Pollution," to the Ministry of Agriculture and Fisheries, was considered, especially in regard to the alleged deleterious effect on fish life of the washings from tarred roads. A Committee was appointed to investigate further the position of tar for road purposes, and to report to the Board thereon.

MODEL SPECIFICATION OF WATER PIPES AND FITTINGS ISSUED BY THE MINISTRY OF HEALTH.

This specification (which had previously been circulated to members of the Board) indicated that section 5, relating to hot water apparatus, was on the lines of the specification agreed between the Committee of the Council and the Ministry of Health. This provides that a geyser fitted with an automatic valve can be connected direct off the main water supply.

METROPOLITAN WATER BOARD REGULATIONS WITH REGARD TO HOT WATER APPARATUS.

It was reported that the Metropolitan Water Board persisted in their attitude of definitely refusing to allow a geyser to be fixed to a main. The Council had, therefore, in consultation with their Solicitor, prepared a request to the Water Board to amend their regulations. This document, after being signed by ten users of water in the area of the gas undertakings affected, will be served on the Water Board accordingly.

EVENING STAR CHAPTER No. 1719.

There was a good attendance at the Evening Star Chapter No. 1719 on Wednesday, Nov. 12. It was the Election Convocation, and was held at the Freemasons' Hall, Great Queen Street. The chairs were occupied by Ex. Comp. F. C. Tilley, P.Z. 1348, as M.E.Z.; Ex. Comp. Arthur Valon, P.Z. 2413 (acting H. in the absence of Ex. Comp. H. W. Packham); and Ex. Comp. Alfred C. Beal, P.Z. 2413 (acting J. in the absence of Ex. Comp. S. Freeman Burrows).

Preliminary business having been disposed of, three candidates were balloted for, and were duly elected: Ex. Comp. Ralph Carr (Ridley Chapter No. 2260), of Westminster, for joining membership; and his business partner, Bro. E. J. Davison (Evening Star Lodge, No. 1719), of Westminster, and Bro. Ralph Morris Goodman (Vernon Lodge, No. 1802), of Retford, as candidates for exaltation.

The ceremonies were carried out by Ex. Comps. Tilley, Valon, Beal, and Ex. Comp. Arthur E. Eves; together with Comp. Charles Clare, Ex. Comp. Charles Hulme, P.Prov.G.Std.B.Mddx., P.Z. 382, Comp. Rae P. Normand, and Comp. Walter M'Dowall in the offices respectively of P.S., Scribe N., Scribe E., and 1st A.S.

In appreciation of his services in promoting the success of the Chapter, a Past Principal's Jewel was voted to Ex. Comp. Tilley, on the proposal of Ex. Comp. Valon.

Consideration was given to the question of altering the date of the Installation Convocation to the second Wednesday in April, with the object of avoiding clashing with the Annual Charity Festival at Freemasons' Hall, which takes place on the same date in May on which the Chapter now meets. It was agreed to change the date to April.

The following is the list of officers who were elected for the year 1925-26:

Ex. Comp.	Harry W. Packham	Z.
" "	S. Freeman Burrows	H.
" "	Charles Hulme, P.Prov.G.Std.B. Middx., P.Z. 382	J.
" "	Reg. W. Foster	Scribe E.
" "	William A. Surridge, P.G.Std.B., P.Z. 1201, 1397. 1719	Treasurer.
" "	Arthur Valon, P.Z. 2413	D.C.
Comp.	Charles Clare	Scribe N.
"	Rae P. Normand	P.S.
"	Walter M'Dowall	1st A.S.
"	Wallace W. Hammond	2nd A.S.
"	E. G. Bartholomew	Steward.
"	G. D. Bidwell	Steward.
Ex. Comp.	R. H. Goddard	Janitor.

After the usual concluding items of business had been transacted, the companions repaired to the Connaught Rooms for dinner, the respective chairs being occupied by Ex. Comps. Tilley, Eves, and Beal; Ex. Comp. Valon acting as I.P.Z. The Loyal Toasts were cordially observed. That of "The Officers of Grand Chapter, Present and Past," given by the M.E.Z., was responded to by Ex. Comp. Surridge and Ex. Comp. Lionel F. Dunnett, P.A.G.D.C., Hon. Member of the Chapter. Ex. Comp. Surridge took occasion to offer some remarks on the Special Grand Festival in connection with the Masonic Million Memorial Fund which is being organized to take place at Olympia on Saturday, Aug. 8 next —H.R.H. the Duke of Connaught presiding as Grand Master of the Order. He was glad that the Evening Star Lodge had at its last meeting decided to support the movement; and he believed that the scheme, which had been so long in hand, would ultimately be crowned with success by the great gathering of next year. Comp. Clare proposed the toast of "The Principals of the Chapter," on whose behalf it was acknowledged by Ex. Comps. Beal, Eves, and Tilley. The latter gave that of "The Exalters," to which Comps. Davison and Goodman replied. To "The Past Principals and Officers of the Chapter," which was submitted by

Ex. Comp. A. E. Croager, Ex. Comp. J. W. Broadhead, P. Prov. Dep. G. Reg. W. Yorks, P.Z. 61, 1719, and Ex. Comp. George Hands replied for the former, and Comp. Rae P. Normand for the latter. It was announced that in connection with the Evening Star Lodge a Ladies' Evening was in course of arrangement, and that members of the Chapter would be invited to attend it with their friends. The date is Monday, Jan. 26, and the place the Edward VII. suite of the Hotel Victoria, Northumberland Avenue.

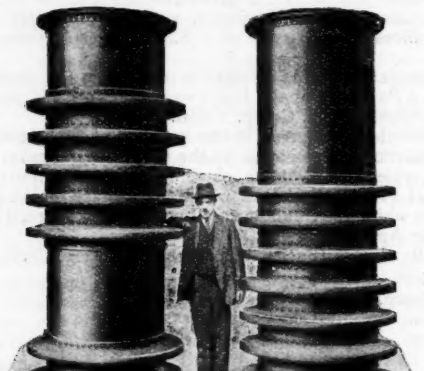
STANDARD METERS.

The "Standard" type of gas meter was designed after exhaustive inquiry by the Life of Meters Committee set up in 1917 by the Institution of Gas Engineers. For the past six years it has been manufactured by most meter makers, but up to the present has not been adopted by the majority of gas undertakings. This fact is probably due to two reasons. In the first place, the price asked for the standard meter has been higher than that of the meter rated by lights. In the second place, many undertakings have been in doubt as to the interchangeability of the couplings on the two types, as well as to the dimensions of the respective cases.

In the notice issued by a well-known maker of dry meters last week, a stand is now to be made to eliminate the manufacture of "lights" meters. This we think will prove to be a sound policy for the gas undertakings, as they will obtain meters of longer life at reduced prices. Moreover, such meters, where they are fixed in place of the "lights" type of equal case dimensions, on account of their larger capacities will be more satisfactory and not so liable to overworking. The "Standard" meter will carry the same guarantee as the "lights" pattern has carried; and credit is due to the maker who has put into operation this scheme of "new standards for old lights."

PRESSED STEEL EXPANSION JOINTS.

Our illustration shows an example of Rose's patent pressed steel expansion joints, which are highly suitable for all gas apparatus, as well as for steam, air, or water. These joints are manufactured by The British Appliances Manufacturing Company, Ltd., Longclose Works, Dolly Lane, Leeds.



Rose's Expansion Joints.

The principal advantage of these expansion joints is that they are constructed without either welded or riveted circumferential seams in the bulb portion, thus avoiding cracks or leakages. They have a flat surface in the centre, which remains rigid when in operation, so dividing any movement that takes place between the two walls. The sides of the bellows are practically vertical, thus giving the utmost freedom of action and flexibility.

Benzole Prices.—We learn from the National Benzole Association that the price in England and Wales of "National" benzole only, in 2-gallon cans, is now 2s. 1½d.; in the London zone the price is 2s. 0½d.

Midland Association of Gas Engineers and Managers.—In addition to the election of officers and new members, two papers are to be read at the autumn meeting of the Association, which, as already announced, will be held in the Grand Hotel, Birmingham, on Thursday of next week, Nov. 27, at 2 30. One of these will be on "Carbonization in Continuous Intermittent Verticals," by Mr. Frederick Shewring, of Stratford-on-Avon; and the other, "Notes on the Working of Vertical Retorts at Foleshill Gas-Works," by Mr. Charles F. Tooby, of Coventry.

THE CONSTITUENTS OF COAL TAR.*

Reviewed by Dr. Geoffrey Weyman.

The book under review is an additional volume of the series of "Monographs on Industrial Chemistry" edited by Sir Edward Thorpe, which are more especially known to the gas industry by virtue of Prof. Bone's "Coal and its Scientific Uses."

The object of this book, says the author, is to be useful to those chemists who are interested in the individual constituent substances which together form coal tar. Probably no one concerned in the production and working-up of coal tar will admit to-day that he is not interested in the constituents, though only a few substances out of several hundred occurring are separated as more or less pure compounds on an industrial scale. It is unfortunately the fact that the demand for those substances which are separated can be more than satisfied; and as a consequence the bulk of the coal tar is disposed in crude forms for fuel or road construction. The possibility of increasing the value of tar lies in further demand arising in various directions for the component parts or for the pure substances derived from coal tar. It is obvious that no such demand can arise until the constituents of tar are well known and have been studied with a view to their technical application for new purposes or as substitution for more expensive compounds. A considerable increase in the value of tar would be a matter of national importance and would conceivably affect the economics of the carbonization or other treatment of coal. Any work therefore which contributes to this desirable object is to be welcomed.

The volume in question is actually divided into five parts, but naturally falls into only two. After a general consideration of tar as a whole, the properties of the constituent hydrocarbons, oxygen compounds, sulphur compounds, and nitrogen compounds are dealt with in the order given. The preliminary discussion is all too brief, and as a result many statements are made in a general sense which will be at variance with the practical experience of many readers. Comparison of vertical (presumably continuous vertical) and horizontal retort carbonization places the yield of tar as the same in quantity, while the difference in quality is attributed to the vertical retort allowing distillation to commence at a lower temperature. Surely the temperature of decomposition of coal is not altered by the coal being placed in a vertical as opposed to a horizontal retort. The comparison of the melting points of pitches from tars produced at different temperatures requires a little more explanation, as so much depends on the method by which the pitch is ultimately produced. The statement that coke-oven tar possesses a lower density, less pitch, and a lower viscosity than gas tar also needs qualification, and is probably not correct in a general sense. In referring generally to the various classes of constituents, examples are given of certain pyrogenic changes, particularly in connection with aromatic substances, which might account for their appearance in coal tar. This subject is of so great an importance to the gas industry that an extended treatment would have been more than welcomed. The significance of the presence of oxygen both in the coal substance and in the air present during carbonization is not given its full value. It is interesting to find that the author apparently inclines to the acetylene theory to account for the appearance of certain substances, and notes the far-reaching effect which activated charcoal would have if present in the retort. One would imagine that fusain might exert an influence in a similar manner, though not to the same extent.

The author, in referring to nomenclature, advocates the use of the termination *-ole* for benzole, toluole, and xylole, which are the commercial mixtures of the pure substances benzene, toluene, and the xylenes, in preference to the termination *-ol* which should be restricted to alcoholic substances. While this is undoubtedly preferable, it is feared that now that "National Benzol" has extended the use of the improper word to the general public a correction could no more be made than a similar one for petrol. It might be pointed out that the author himself is not consistent. Pyrocatechin, an aromatic alcohol, is mentioned in Table 3, on p. 111, and is indexed on p. 212. The correct name, catechol, which occurs on pp. 25, 119, 122, 123 is separately indexed on p. 210. Hydroquinone might preferably have been called quinol. The subject in reference to benzole, we are told, came up particularly during the war, when a responsible Committee came to an agreement on the matter. From a footnote it appears that this Committee cannot now be traced, and has evidently been lost in the fog of war—perhaps not undeservedly.

The remainder of the book is concerned with a detailed list, with references, of the physical properties of the various pure substances which occur in coal tar. Notes are also given of the occurrence, laboratory preparation, laboratory purification, estimation or identification, and more important reactions of the individual substances, in so far as it is considered that the importance or extent of the occurrence of a substance justifies the space. Particular attention has evidently been given to the physical constants which are very often the only means of separation and identification. Information as to the toxicity of the various

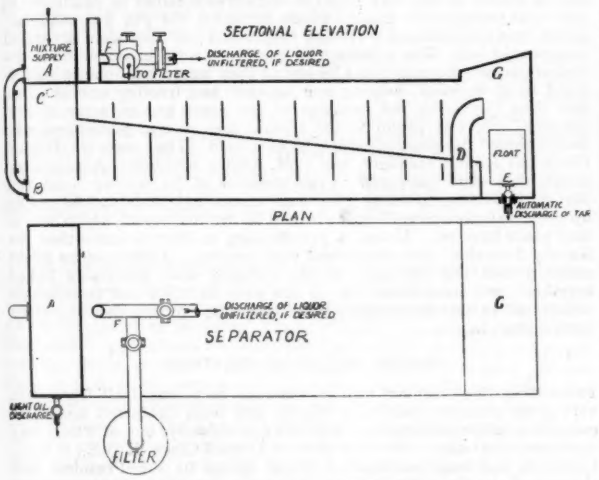
* "The Constituents of Coal Tar," by Percy E. Spielmann; published by Longmans, Green & Co., London, 1924, xl. + 219 pp., with two folding charts, price 12s. 6d.

substances is a feature not often to be met with. References to the uses to which the substances are put are too casual to be of much service. An important omission is the absence of a definite indication of the relative proportions or quantities in which the substances are met with in tar generally, in the different descriptions of tar on the market, or in the various fractions into which tar is usually split. The value of this part of the book lies in the collection of the various physical constants from the scattered literature. The references, some 525 in all, are collected together at the end of the book. About 100 substances are dealt with altogether.

The book is nicely bound and well printed. There is evidence that proof reading has not been too good; slips occur in the text and formulæ—for example, on pp. 6, 69, 95. Generally speaking the book should be found useful for reference purposes. It is not, however, a monograph on industrial chemistry in any sense of the words. It will be found in libraries and research laboratories rather than in the industrial and commercial spheres.

THE PIRBRIGHT SEPARATOR.

A problem that has been awaiting solution for some years, and which it is now claimed has been solved, is the economical separation of coal tar, ammoniacal liquor, and light oils at gas-works. The usual practice—at any rate in the smaller works—has hitherto been for the gas companies to dispose of the mixture to the tar distilleries; but owing to the expense of separating the mixture into its component parts, the price they got for it from the distilleries was usually negligible. A plant has now been produced which should have a large demand in gas-works; and, as its price is reasonable, the capital expenditure involved, state the patentees, would be written off in a short time by the enhanced prices obtained for the separated products.



Pirbright Separating Plant—Gas-Works Type.

The plant in question, which has recently come to our notice, is a combination of a gravity separator and filter. The separator element, which works on the combined principles of baffles, gravity, and horizontal flow, is fitted with automatic discharge valves, so that the separated liquids are recovered right down to the interface without any possibility of the wrong liquid getting into the effluent. It is capable of dealing with the separation of ammoniacal liquor from tar the specific gravity of which differs appreciably from unity. The use of this plant, which is entirely automatic, obviates a considerable amount of hand labour, and, in addition to greater efficiency in separation, effects substantial economies in space and time. Other points in its favour are that it can be easily cleaned, requires practically no attention, and costs next to nothing for operation. The filter element ensures the complete absence of all traces of tarry matter held in suspension in the ammoniacal liquor, an advantage which will be readily appreciated by all who have had experience in the working-up of ammonia products. Its action is rapid, for it is capable of filtering as much as 200 tons of liquor per hour. The filtering medium can deal with large quantities of liquor before it needs renewal—an operation which can be carried out with facility and at small cost.

The patentees of this plant, the Pirbright Company, Ltd., of Bond Court House, Walbrook, E.C. 4, are prepared to back up their guarantee as to its efficiency by making an offer to gas-works that they will instal a plant free of cost. Should it function to the complete satisfaction of all concerned, the plant would be paid for in the normal way; otherwise they would remove it from the gas-works without making any charge at all.

First Bottle shows Mixture taken from s.s. "Leviathan" Ballast Tanks, and Others show Crystal-Clear Water taken from Effluents after Separation.

This plant is an adaptation of a patent oil separator marketed by the Company, and which has proved extremely efficient in other spheres. The original design was for incorporation in the double bottoms of ships, for separating oil from the oily ballast water before discharge overboard; and recent demonstrations at Portsmouth and Southampton have shown that the plant is both efficient and economical. Another adaptation with which marked success has been achieved is in the separation of waste fats and greases from the effluents of margarine factories; plants already installed having shown the investment to be an extremely profitable one. The plant therefore has a very wide application in the industrial market.

Separator at Work Discharging Clean Water into Harbour.

Locating a Condenser Water Leak.

The author of a "wrinkle" appearing in the pages of the "American Gas Journal" remarks that probably the most annoying mishap that can occur to a multitubular condenser is for a leak to develop in the tubes or plates which separate the gas and the water divisions. He has had this experience with an apparatus of the style in which the water surrounds the tubes and the gas passes through them. The leak, of course, first manifested itself by the weakened ammoniacal liquor. The bolted plates covering the compartments are so placed that it is necessary to raise two of them to reach any one double water compartment, and this involves the removal of 158 bolts. The leak might have been in a division plate at either end, in a top or bottom tube-sheet, or in the tubes themselves in any one of the six double compartments. A line of pipe leading to a drain runs along the side of the apparatus, with a valved connection to the bottom of each water compartment, for drawing-off deposited mud. This attachment was made to assist in the following manner: The mud was first drawn-off, then all valves were closed, including that on the main line to the drain. Water was turned on to fill the compartment to the normal height, and shut-off. Then a piece of pipe of a length equal to the vertical height of the water divisions was attached by an ell-piece to a cross on the mud pipe, and held by a rope so that it could be swung on the ell as a centre from a vertical to a horizontal position. After standing overnight, the water in the leaky compartment had all escaped down to the level of the break. The swinging pipe was then used as a gauge, the valves on the several water divisions being opened one at a time, showing all compartments full but one, and thus infallibly indicating the leaky section, as well as the height at which the leak existed.

SOCIETY OF BRITISH GAS INDUSTRIES.

AUTUMN GENERAL MEETING.

THE Autumn General Meeting of the Society was held last Wednesday, at the Hotel Victoria, Northumberland Avenue, London, W.C.; the business proceedings following a well-attended luncheon, with Mr. D. MILNE WATSON, D.L., M.A., LL.B. (the President), in the chair. By his side was Mr. J. Wilfrid Drake (the Chairman of the Council), and with them at the top table were Sir Dugald Clerk, Sir Robert Hadfield, Sir Napier Shaw, Prof. Arthur Smithells, Mr. C. F. Spencer (a Director of Messrs. Drakes, Ltd., Chairman of the Leeds Fire Clay Company, Ltd., and Chairman of the Edison Swan Electric Company), Mr. A. J. Stubbs, Mr. J. W. Broadhead, Mr. Charles Clare, Mr. Albert Cliff, Mr. Samuel Cutler, Mr. Frederick C. Tilley, and Mr. B. B. Waller.

After the luncheon, the PRESIDENT submitted the toast of "His Majesty the King," which was loyally honoured. He then called upon Mr. Spencer.

CO-OPERATION IN THE GAS INDUSTRY.

Mr. C. F. SPENCER said he counted it as an honour and as a pleasure to have the privilege of proposing the toast of "The Society of British Gas Industries." His Association with the gas industry was not so close as with the comparatively "infant" industry of electricity; but he was bound to say that, when one looked into the organization of the gas industry, one was much attracted by the co-operation which existed between every section. This co-operation was a pattern to many other industries of the country. ["Hear, hear."] It was an added pleasure to him to propose this toast, because the Society had as Chairman one of his business colleagues, Mr. Wilfrid Drake, with whom he had been associated for many years. He was sure that Mr. Drake, by his zeal and his assiduity, would add lustre to the office which he occupied, and that when he left it the members would be proud of having had him as their Chairman. It was also an honour to couple with the toast the name of Mr. Milne Watson, who was the Governor of the great Gas Light and Coke Company—an undertaking so large that it needed a man of great ability to control it. The gas industry, to his mind, was an impartial one. Years ago, when he used to give evidence before Committees of the House of Commons and the House of Lords on various Gas Bills, he had always been struck by the very fair manner in which the work of the gas companies and of those local authorities who owned gas undertakings was conducted. The general provision that gas companies could only pay more than a certain dividend when the consumers also got a benefit, showed a spirit of co-operation. In many other ways, also, the value of co operation was shown. When gentlemen were associated with an industry of this description, which was largely free from attacks by foreign competition, and exchanged ideas—the stronger giving ideas to the weaker—it was bound to be in the interests of the industry and of the nation as a whole. As to the respective claims of gas and electricity, personally he was on "both sides of the hedge," which was a very good position to occupy. It was, however, his firm belief that each had its own functions and sphere of operation. Formerly he was Mayor of a town where they had a gas and an electricity supply undertaking working happily side by side. Getting rid of the spirit of unhealthy competition between one undertaking and another, and defining clearly the sphere of activity of each, would help the industries throughout the country. Electricity was to his mind the premier illuminant for domestic purposes; but when it came to outside lighting, heating houses, and cooking purposes, one could not gainsay that gas held the field. They had to recognize these things, and to mark out the sphere which each should occupy. The gas industry was the cynosure of many other industries; and the Society he now had the honour of addressing were doing good work for it.

THE PRESIDENTIAL BADGE.

Mr. J. WILFRID DRAKE said he was in rather a hurry to "take the floor" before the President had an opportunity of replying to the toast which had been so ably proposed by Mr. Spencer. The task he had to perform was to him a very pleasant one—namely, to present to the Society, through their President, a badge of office for the use of Presidents now and to come. Originally he had felt great diffidence in mooting this subject. He thought first of all that he would carry out what was in his mind without saying a word to anybody; but prudence suggested that he should confide his secret to another person, and so he broached the subject to his predecessor, Mr. F. C. Tilley, whose counsels he had always found sound. Mr. Tilley suggested that the proposal should be laid before the Council of the Society, which was done, and he was glad to say that the Council received it with a great deal of pleasure. In view of the doubts he had felt about the possible nature of its reception, this had been a great relief to him. The badge was a symbolic one. The top portion of it featured Britannia, as representative of the British nation; while the bottom portion—which was the real medallion, carried out in enamel—was a representation of the great poster of the "Spirit of Coal," which had been used to typify the industry in connection with the Wembley Exhibition. The top and bottom portions were joined together by the seal of the Society of British Gas Industries, which was symbolical of the linking-up of the industry with the nation through the medium of the Society. It was a very great pleasure to him to be able to hand this badge to their President that day, who would be the first to wear it. Mr. Milne Watson was also, to make use of a phrase uttered by Mr. Spencer, on "both sides of the hedge," for he was President of the National Gas Council, as well as of their Society. Than this, they could have no finer example of the unity of the industry. He trusted that the artistic merit combined with the symbolic meaning of the badge would be a source of pride to their Presidents, and that they would feel they were not demeaning themselves or the industry by wearing it. It was the wish of their President that he should invest him with it, and this he was delighted to do. [Mr. Drake, amid applause, then invested Mr. Milne Watson with the badge of office.]

The PRESIDENT said he felt very great pleasure indeed in rising to acknowledge the toast, and in thanking Mr. Drake for his eloquent words in presenting him, as their President for this year, with the beautiful badge of office. He had had many interesting experiences, but this was the first time he had worn such a badge. It was a lovely badge, and he felt sure that, as he did, succeeding Presidents would appreciate the honour which had been done them by its presentation. It was a very nice thought on the part of Mr. Wilfrid Drake. The badge was, as Mr. Drake had said, symbolic of the Society, and the enamel work was admirable. With regard to the toast, he had to thank Mr. Spencer for the kind things he had said about the Society and about the gas industry in general. He was proud indeed to occupy the position of President of the Society—an event which, he took it, was symbolic of the fact that the industry, whether as producers of gas or as suppliers of the materials by which the gas was manufactured, was one industry. United they stood; if they were separated they would fall. The suppliers of gas could not get on without the manufacturers of goods; and he hoped they would continue to go forward hand in hand, helping one another and trusting one another, and thus furthering the interests of the great gas industry of this country. He was proud to see around him several gentlemen who had occupied the position which he now held. They were Sir Dugald Clerk, Sir Robert Hadfield, and Prof. Arthur Smithells. Among their guests they were honoured by the presence of Sir Napier Shaw and Mr. A. J. Stubbs, to whom they were exceedingly indebted for giving up their valuable time in order to join in the discussion which was to take place later on. It was a gratification to him to know that the Society flourished, and progressed year by year. There was no doubt about it that the two sides of the industry were inevitably linked together; and he trusted that in his year of office the relationship which had existed for so many years would be even warmer and more cordial than before.

HONOURS AND CONGRATULATIONS.

Proceeding, the President said he was sure they would all learn with very great pleasure that high honour had been conferred upon two eminent gentlemen connected with the gas industry, one of whom was with them that day. He referred to Sir Dugald Clerk, K.B.E., F.R.S., to whom had been presented a Royal Medal by the President and Council of the Royal Society, for his application of scientific principles to engineering problems, particularly to the development of the internal combustion engine. They were all aware of the great work done by him, and delighted that he should have received this new honour. He was sure that they would wish to congratulate him, as a Past President. [Applause.] Another name in the list was that of Prof. C. V. Boys, F.R.S., upon whom the Royal Society had conferred the Rumford Medal, for his invention of the gas calorimeter. He was sure they would wish the Secretary to write congratulating Prof. Boys, who, he regretted to say, had not been very well of late. He was intimately associated with the gas industry as a Gas Referee, being one of the most distinguished men who had ever held that office. The industry, of course, depended very much upon the Gas Referees, whose decisions were of the greatest importance, and they were proud to think a man of Prof. Boys' eminence should occupy that position.

Prof. ARTHUR SMITHELLS also expressed his delight at the honour done to Sir Dugald Clerk, who was originally, and always would be, a chemist, and who had assumed the rôle of a great engineer. They all knew the eminent work in the latter respect which had rendered him a great benefactor to the gas industry. He was a great friend of his (the speaker's), and thus it was a personal pleasure to him to see Sir Dugald so honoured by the leading Society in the world.

Sir DUGALD CLERK remarked that he was very grateful to them for the kind way in which they had received his friend the President's intimation of the honour done him by the Royal Society. He had always had a very warm feeling for the gas industry. It had been his pleasure and his honour to be the first President of the S.B.G.I., and he had never ceased to take an interest in all its doings. He also had the honour of being on the "other side of the hedge," for he was a Past President of the Institution of Gas Engineers.

LORD MAYOR WEST.

The PRESIDENT said that before they proceeded to their business meeting, he was sure they would all heartily approve of the sending of a telegram to Alderman Fred West, congratulating him on his appointment as Lord Mayor of Manchester. His name was known to everyone in the industry, and he was one of the founders of the Society, of which he was a Past Chairman. [Applause.]

The following telegram was subsequently dispatched:

Alderman WEST, Lord Mayor, Town Hall, Manchester.

The Society of British Gas Industries, in autumn meeting assembled, at the Hotel Victoria, send you their hearty congratulations on your election as Lord Mayor of Manchester, and wish you a very happy and successful year of office.

MILNE WATSON, President.

BUSINESS MEETING.

The business meeting was afterwards held in the Oak Room at the Hotel—Mr. D. MILNE WATSON (the President) in the chair.

The SECRETARY (Mr. Arthur L. Griffith) had received apologies for absence from Lord Weir of Eastwood, Lord Riddell, Sir Henry E. Duke, Sir Arthur Duckham, and Prof. Harold B. Dixon.

Mr. J. WILFRID DRAKE (the Chairman of the Council) read the following

Report of the Chairman of the Council.

In accordance with past practice the Council have met regularly each month, and the meetings have been well attended. Many matters have been considered and dealt with—some of which are summarized in the following report.

CARBON MONOXIDE IN PUBLIC GAS SUPPLIES.

The Council have been considering for some time how the Society could render assistance to the National Gas Council in connection with the recommendations in Mr. W. J. A. Butterfield's Report to the Board of Trade, and especially with regard to the requirements of safe fittings, and welcomed the invitation from the Gas Safety Committee of that Council to a Conference in October, when the matter was discussed and a Joint Committee formed consisting of eight members of each body. It is hoped that good results will emanate from the efforts of this Committee.

BRITISH EMPIRE EXHIBITION.

The Council are gratified with the great success which seems to have been secured by the Gas Exhibit at Wembley. A very remarkable amount of free Press publicity has been obtained, in addition to the large amount of advertising that has been done. Already there are signs that an increase in business in gas appliances has resulted; and it seems only fair to credit the Exhibit with a large part of this. The Council very much appreciate the co-operation of all members in subscribing so large a sum towards the cost of the Exhibit, and of those firms who have provided the apparatus displayed, for their harmonious acceptance of decisions with regard to allocation. The position of the Society as part of the gas industry has been greatly strengthened.

RETORT SETTERS.

It is hoped that by the time this report is presented the negotiations will have been completed for the continuance of the Manchester Agreement between section 1 of our Society and the Amalgamated Union of Building Trade Workers, in conjunction with the further agreement between the Federation of Gas Employers and the Amalgamated Union of Building Trade Workers. It has been a matter of very great difficulty to reconcile the difference in the working conditions and the rate of pay for the union members working for the gas undertakings, as against those working for the gas-works contractors. Much useful work has already been done; and it is hoped that the negotiations will terminate in agreements which will be of lasting benefit by placing the gas industry outside the scope of the building trades' influence.

STANDARD GAS-VALVE FLANGES.

Further progress has been made by the British Engineering Standards Association in connection with the recommendations of the Institution of Gas Engineers and our Society, and it is hoped that very shortly an agreement will be reached.

STANDARD INVERTED INCANDESCENT GAS-BURNERS.

The registration of the trade mark "SOBGI" has unfortunately not yet been completed, but our Patent Agents assure us that they fully expect the applications to the Patent Office will now go through without any further hitch. The difficulty has been owing to the Society being an unincorporated body. I am pleased to say that this morning we were informed that the hearing is down for Dec. 3; but it is not anticipated that there will be any trouble in getting the application through.

STANDARDIZATION OF MEDIUM-SIZE INVERTED MANTLES.

This matter has been under consideration by the Lighting Section, and a certain amount of agreement has been reached. It is hoped that further progress will be made.

REFRACTORY MATERIALS.

Active work is being carried on by the members of the Fireclay Section. Classes have been formed in Stourbridge for workers in the industry, and are meeting with success.

REGISTER OF NAMES OF GAS APPARATUS.

A suggestion was recently brought up from the Gas-Stove Section that a schedule of all names of apparatus should be deposited with the Society; and in the event of a new piece of apparatus being brought out, the files could then be searched to see if the name had been anticipated. The Council approved of the suggestion and recommended that it be adopted generally by the members of the Society. A number of firms have sent in their lists; and the Register will be prepared, which will be available for reference by all the members.

ILLUMINATION COMMITTEE.

Sub-Committees have now been formed by the British Engineering Standards Association to deal with the questions of:

1. Standardization of methods of testing and specifying the characteristics of glassware and translucent materials.
2. Fittings.

A representative of our Council has been appointed on these Sub-Committees; and we shall give all the support we can.

REVISION OF RAILWAY CLASSIFICATION OF GOODS.

Messrs. Tweedy and Holt, of Halifax, have watched our interests at meetings of the Railway Rates Tribunal; and their reports on railway matters are issued in the Bulletin and the monthly circular letter to the members.

UNEMPLOYMENT INSURANCE (NO. 2) ACT, 1924.

Through the National Confederation of Employers' Organizations, representations were made against any increase in the scope of unemployment insurance while the trade of the country is in its present condition. We note that the proposal in the Bill to bring boys and girls between 14 and 16 within the insurance has not been given effect to.

PREFERENTIAL TARIFF TREATMENT OF BRITISH GOODS IN AUSTRALIA AND NEW ZEALAND.

Through the Federation of British Industries a communication from the Board of Trade was considered with regard to proposals under consideration in Australia and New Zealand for prescribing a higher percentage than 25 p.ct. of the value of the British labour and/or material to entitle goods to preferential tariff treatment on importation into those Dominions. Inquiries were addressed to the members; and the replies received recommended that the percentage should be increased to at least 50 p.ct., and a number of firms thought it should be 75 p.ct. The general opinion was that, if any change is to be made in the percentage of British labour and/or material entitling goods to preference, it is very desirable that each constituent part of the British Empire should adopt the same percentage. We have since learnt with a great deal of satisfaction that communications have been received from the High Commissioners of Australia and New Zealand intimating that it has been decided as from April 1, 1925, that goods imported into the respective Dominions from this country will require to have in most cases 75 p.ct. of British workmanship and/or material in order to qualify under the British preferential rate.

STANDARD CONDITIONS OF CONTRACT.

The Contracts Committee of the Federation of British Industries have been conducting an inquiry into contract conditions, with a view to the adoption of standardized fundamental clauses so as to remove unnecessarily harsh and arbitrary conditions. The proposed clauses were referred by the National Gas Council to the Institution of Gas Engineers, and were considered last month at a meeting of representatives of the Institution and our Society, when it was decided that the proposed clauses were not suitable for the gas industry, and that our clauses were preferable.

SMOKE ABATEMENT EXHIBITION, MANCHESTER.

The Society gave their patronage to this Exhibition, which is being held in Manchester this month, and nominated two delegates to attend the Smoke Abatement Conference in connection therewith.

MURDOCH'S HOUSE AND GASHOLDER.

A scheme has been prepared for the acquisition of the house in Birmingham which Murdoch occupied for many years in his epoch-making inventions in connection with the gas industry, and for the preservation as a national memorial of the first gasholder which was used by him, and which is now standing in the works of Messrs. Avery, Ltd., at Smethwick. A small Committee of representatives of the National Gas Council, the Institution of Gas Engineers, and our Society has been set up to consider the matter.

BRITISH COMMERCIAL GAS ASSOCIATION.

The propaganda work of the Association, especially in connection with the Gas Exhibit at Wembley, is proving beneficial to all engaged in the gas industry. We congratulate the Association on their very successful Annual Conference in Liverpool, at which a number of our members were present.

UNIVERSITY OF LEEDS—CELEBRATION OF COMING OF AGE AND THE JUBILEE OF THE YORKSHIRE COLLEGE.

In accordance with a cordial invitation to take part in the celebrations in December, we have nominated two representatives to attend.

CITY AND GUILDS OF LONDON INSTITUTE.

The prizes in connection with the City and Guilds of London Institute's Examinations in Gas Engineering, Gas Supply, and Gas Fitting have been duly awarded, and announced in the Technical Press.

QUARTERLY BULLETIN.

We have felt that the Quarterly Bulletin, while doing very useful work, was too intermittent to be of real service in keeping our members in close touch with the work of the Society; and we have decided that only two half-yearly issues—one after each of our general meetings—shall be retained, which will contain full reports of our meetings in the Spring and Autumn. Circular letters will be issued after each monthly Council meeting, so that the members will be kept in touch with matters which are being dealt with. We trust our efforts in this particular direction will be appreciated, and that the more frequent communication with the members will tend to a greater interest being taken in the

Society, and to cement the individual interests for the benefit of the industry.

Membership.

The membership of the Society is still steadily increasing; some additional firms having recently become members.

I trust you will consider the report satisfactory, and I have much pleasure in moving its adoption.

Mr. B. B. Waller seconded the adoption of the report.

The Balfour Committee.

The President congratulated the Society upon the work done. They knew, he said, that the late Government had set up a Committee called the Balfour Committee on Trades and Industry. The National Gas Council had been asked to give evidence before this Committee, and he hoped the Society would agree to collaborate with the Council in putting forward their views in conjunction with the Council. It was rather an urgent matter, so he trusted the Society would see their way to let their Council deal with the matter, or else appoint a small Committee to assist the National Gas Council in the preparation of evidence.

Mr. Drake said he had had a letter in connection with this subject, which had been mentioned at their Council meeting that morning. It was then decided that they should discuss the question with Mr. Milne Watson, and that they approved of assisting in the direction suggested.

The report was put to the meeting and carried unanimously.

Some Aspects of the Metric System.

Mr. J. Wilfrid Drake then gave an address on "Some Aspects of the Metric System." This, with some points from the discussion, follows this report. He said he was not putting his address forward from the point of view of the expert, but as an amateur. He had certain views at the back of his mind, and was really seeking further information.

Alderman F. Templer Depree proposed a hearty vote of thanks to Mr. Drake for his address, and said he was wondering what steps they were going to take as a Society to bring the matter before the Decimal Association.

Mr. F. C. Tilley seconded, remarking that they were very proud of their Chairman, who had dealt with a very difficult matter, on which even experts did not seem to have arrived at any definite scheme to put before the people.

Mr. Drake thanked the members for the way in which they had received his address.

Greetings from and to America.

Mr. A. Gordon King (New York), Service Engineer to the American Gas Association, said, in the course of the discussion, that when he first entered the room he felt somewhat of a stranger, but this impression was soon removed. He knew their Chairman, Mr. Drake, a good many years ago in Canada, and then there was Dr. E. W. Smith, who not long ago took part in the proceedings of the American Gas Association. Again, there was his friend Mr. E. J. Davison, who taught him to use the Orsat apparatus twenty years ago. The problems were evidently largely the same in both countries, but the formation and working of the Associations were different. The American Gas Association comprised individual members, manufacturing firms, and company members; and all had their own sections. The consumption of gas in the United States was increasing at the rate of about 10 p.ct. per annum. The natural gas fields were slowly petering out, and the manufactured gas industry had to get this huge business eventually. They were now pushing the industrial business; the proportion of the total sales of gas that was used for these purposes was about 25 p.ct. It was not only with very keen personal pleasure, but with a sense of duty, that he officially paid his respects to the Society of British Gas Industries, as the representative of Secretary-Manager Alexander Forward, of the American Gas Association, with headquarters in New York City.

Mr. Drake (who had then taken the chair) tendered the thanks of the meeting to Mr. King for bringing his message, and asked him to take back with him to America the greetings of the Society of British Gas Industries. [Applause.]

The President-Elect.

It was announced that the Right Hon. Sir Alfred Mond, M.P., has consented to be the next President of the Society.

Before separating, the members took tea together.

SOME ASPECTS OF THE METRIC SYSTEM.

By J. Wilfrid Drake, Chairman of Council, Society of British Gas Industries.

[An Address delivered at the Autumn Meeting.]

I hope the title I have chosen has not led you to expect an address of a comprehensive nature. It was selected at a period when I was extremely busy. Mr. Griffith was urging me to furnish him with the title of the subject on which I was going to speak; and in view of the fact that I had been interested in metric matters for some time, I informed him off-hand that I would address you on "Some Aspects of the Metric System." My idea, of course, was that such a broad title would allow me considerable rope.

You will realize that there is a vast difference between being interested in a subject and knowing sufficient about it to be able to give an address which will bear close scrutiny. Had I, in the earlier days, realized the difficulties which waylaid me, it is a certainty that I should have addressed you on something less contentious; for, though I was aware that the metric system generally was a huge question, I never for a moment anticipated any difficulty in treating of "some aspects" of it in a simple and interesting manner.

I believed I had certain ideas of my own; but on preparing my address I began to find that most of them were anticipated years ago, so that all claim to novelty for my views has been eliminated bit by bit. If there is any claim to novelty at all, it will all centre round one tiny portion concerning the manner in which our money can be used in conjunction with a decimal system.

Now, when the subject of the metric system is introduced, I am inclined to believe that the thoughts of the average person immediately travel in the direction of decimal coinage; and it is in connection with this branch that I would deal. There is not one suggestion for decimalizing our coinage which, from some point of view or other, is not immediately ruled out of court as a mad scheme. Hundreds—nay, I believe thousands—of suggestions have been made from time to time for this purpose; and I do not think that any suggestion I venture to put forward will have any greater success than those which have gone before. Time alone will show if they possess any outstanding merit. The decimalization of our coinage is a very big question. In our country, I believe, the suggestions put forward, with two exceptions, necessitate surgical operations being performed on every denomination of coinage in our currency.

There are six rival systems of coinage:

(1). Pound-Mil System.

The pound-mil is based on the pound sterling being divided into 1000 mils instead of 960 farthings; the coins advocated being 1, 2, 3, 4, 5, 10, 25, and 50 mils, one florin, 5 florins, and £1.

Advantages.	*Disadvantages.*
Gold and silver coins retained. Statistics, funded debt, and finance undisturbed.	New copper coinage needed. Four per cent. reduction in value of equivalent copper coins. Three decimals used.

(2). Florin-Cent System.

This system is based on the florin being divided into 100 cents instead of 96 farthings.

Advantages.	*Disadvantages.*
Gold and silver coins retained. Statistics, funded debt, and finance readily converted. Only two decimals needed.	New copper coinage needed. Four per cent. reduction in value of equivalent copper coins. Pound-sterling prestige effected.

(3). Shilling-Cent System.

This is based on the present shilling being divided into 100 cents.

Advantages.	*Disadvantages.*
Gold and silver coins retained. Statistics, funded debt, and finance readily converted. Only two decimals needed.	New copper coinage needed. Four per cent. reduction in value of equivalent copper coins. Pound sterling impaired. Multiplying factor needed in statistics, funded debt, and finance conversion.

(4). Franc-Centime System.

This is based on the franc being divided into 100 centimes, of which 10 are nearly equal to our penny.

Advantages.	*Disadvantages.*
Claimed to be used by ninety millions of our allies.	Complete new coinage required. Funded debt, statistics, and finance much disturbed. Unit very small.

(5). Dollar-Cent System.

This is based on the U.S.A. dollar being divided into 100 cents, each equivalent to our halfpenny.

Advantages.	*Disadvantages.*
Used by 100 millions of English-speaking people. Copper coins retained. Only two decimals used.	New gold and silver coinage needed. Statistics, funded debt, and finance much disturbed. Lack of small-value coins. Pound-sterling prestige impaired.

(6). What I Term the £ s. d. Decimal System.

The sponsors of this system recommend that the shilling and the pound should be retained at their present values, but that

the penny, which is only a token coin and not one of face value, should be raised to make it represent one-tenth instead of one-twelfth of a shilling. I should say here that up to a short time ago the pound-mil system was the one advocated by bankers, chambers of commerce, and the Decimal Association; but I think that this system has since been ruled out of serious consideration, and its place taken by the "£ s. d. Decimal System."

This latter is certainly very ingenious and simple in reckoning; but it is not truly an ideal system, because there are ten pennies to the shilling but still twenty shillings to the pound. The shillings and pence can be converted to decimal fractions of the pound by simply halving. Thus 17s. 4d. would become 0·87£; 18s. 6d. would become 0·93£; 9s. 3d. would become 0·465£. Again, by this method, you will realize that 17s. 4d. is 174d., that 18s. 6d. is 186d., and 9s. 3d. is 93d. As in the "Pound-Mil" system, not less than three places of decimals will be required to express certain sums in decimals of a pound, as shown by the example of decimalizing 9s. 3d. The very serious objection to this system is that the value of the penny must be altered.

Now, supposing this system were put into operation, I ask you what relationship our coinage then bears to that of any other nation with whom we do business? The reply is obviously "none." Against this it might easily be argued that in countries which have the dollar-cent system or the franc-centime system the currency is not interchangeable, due to fluctuating rates of exchange. Take America and Canada. I remember the time in my own experience when American money would be accepted in Canada, but Canadian money was not acceptable in America, except in the period of financial collapse somewhere about 1907 or 1908, when the great Knickerbocker Trust of New York and other large banking companies of America had to shut their doors. At that time the American working man refused American money and insisted upon his wages being paid in Canadian money. I had an experience of this, so that I can vouch for the accuracy of the statement.

Again, take Belgium and France. You will find that, while they both have coinage nominally of the same value, the rates of exchange are quoted so very differently that it would appear that no two countries can have a currency which is interchangeable, without any discount or premium. The question of the rate of exchange, however, does not affect the Frenchman using Belgian money in Belgium, nor does it affect the Belgian using French money in France. The Canadian is perfectly at home with American money in the States, while the American is equally at home with Canadian money in Canada. But I ask you, is the American perfectly at home with French money in France, or is the Frenchman at home with American dollars in America, though these are all decimal coinages? The answer is obviously that there is considerable confusion. There is not that relationship between the dollar and the franc which enables the alien to think in the currency of the country. Likewise, if the "£ s. d. Decimal System" were introduced into this country, there is no other country in the world possessing a similar coinage; and every visitor would be at a disadvantage, probably as much as they are to-day, and we also should be lost.

The proposition which I wish to outline to you is the adoption of the "dollar-cent" system, the basis of which is the U.S.A. dollar, which is divided into 100 cents. If any of you were asked what an American dollar was worth, you would at once reply 4s. 2d. Well, 4s. 2d. is 50d. or 100 cents. The value of our half-penny is practically the same as the American cent; and I suggest that this coin is *the* basis from which to work. The mere fact of reckoning in dollars and cents would not be revolutionary, because there would be no interference or alteration in the value of a single one of our existing coins. *Mark this very carefully, because it is of the utmost importance.* All our denominations—paper, gold, silver, and copper—would be readily convertible into the new terms by reckoning them back into halfpence, since, by taking two decimal places, the result is dollars and cents. For instance, decimalized:

Sixpence would become	. . . . .	12 cents
Shilling ,, ,,	. . . . .	24 ,,
Two shillings ,, ,,	. . . . .	48 ,,
Half-crown ,, ,,	. . . . .	60 ,,
Five shillings ,, ,,	. . . . .	$1.20
Ten shillings ,, ,,	. . . . .	$2.40
One pound ,, ,,	. . . . .	$4.80

In adopting the dollar-cent system there would necessarily be issued dollar bills of denominations 1, 2, 5, 10, 25, 50, and 100, and coins (say) like the American and Canadian 5, 10, 25, and 50 cent pieces, but so designed and minted as to prevent being confused with our existing coinage. The decimal coins themselves could be reckoned back into £ s. d. A 5-cent piece would be 2½d., a 10-cent piece 5d., a 25-cent piece 1s. 0½d., and a 50-cent piece 2s. 1d. The two systems would work alongside very happily indeed, and the same coinage could be used by those who preferred the dollar-cent system, and retained in the reckoning of £ s. d. by those who were of the opinion that they were too old to change, or found themselves unequal to the problem of getting used to the new system—and yet there would be no problem. The thing would be simplicity itself, and everyone would automatically drop into it.

Obviously, under the new system, amounts of over 100 cents would be paid with dollar bills. The amount of change required for any portion of a dollar could not be more than 4s. 2d., and there would be no necessity therefore for keeping that huge amount of change in one's pocket, as there is to-day. Feel in your pockets and contrast the huge amount of change which you have to keep here with that which you find necessary when travelling in countries with a decimal coinage. The smallest paper denomination we have is the 10s. note; and the usual thing in payment, in a shop, of an amount above the dollar is to present a 10s. note and to receive the change. In time one gets so weighed-down with coins that one begins to pay in silver. The same remark applies to the £1 note. We should all be very much lighter in our pocket without having any less money.

At present, the Englishman who goes to Canada or the United States of America experiences very little difficulty in paying-out the correct sum; but he has great difficulty at first in judging and thinking clearly in the values of the new system. Even this, however, comes home to him very quickly; and it would speedily become second nature for shop assistants and others to give the value off-hand in either coinage.

Under the dollar-cent system our existing coinage need only be replaced gradually, there being no necessity for "whole-hog" methods. When called in, it would be replaced by the decimal coinage; and I can foresee a very great demand quickly arising for the new coinage in preference to the old. I realize that objections will be raised by some people regarding this system; but I urge that no real objection can be raised, because, in accordance with my proposals, no alteration is made in the value of a single coin, whereas by any other system of which I have read—even that advocated by the Decimal Association—an alteration in the value of some coin is demanded, which, to my mind, would be objectionable from every point of view.

Mr. Allcock, Vice-Chairman of the Executive Committee of the Decimal Association, arguing in favour of the increase in the value of the 1d. from one-twelfth to one-tenth of a shilling, says that inflation of our currency has reduced the purchasing power of our coins, and that we cannot expect the restoration of the popular penny unless the value of the penny is itself increased. It is argued that the increased cost of living, as compared with pre-war level, has involved the payment of higher wages, and has so raised the cost of providing "pennyworths" of goods and service that illogical attempts to force the depreciated penny to fulfil its pre-war functions are causing unrest in various penny-basis industries. I think that many objections can be raised against this reasoning. For instance, our depreciated penny will not always remain so depreciated as at present. As our debts are paid, so is the value increased. Surely such objections as those raised, being of a fluctuating, and we hope of a temporary, nature, cannot be considered as fundamental reasons for adopting such a system. Will these reasons hold good in 25 or 50 years? The answer is undoubtedly "No." America and other countries are up against variations in the purchasing power of their money exactly as we are; but I have not heard that they are proposing to alter the value of their coinage to deal with these. I do not think that the higher-value penny would be of any all-round advantage, because, while you are bringing it into line for the purpose of assisting the purchase of dear "pennyworths," you are throwing values out of line in connection with cheap "pennyworths." In the majority of cases this difficulty can be got over by the two for 1½d. or the four for 3½d. method, or with decimal coinage, 2 cents each, 4 for 7 cents. It is claimed that the absence of a coin to represent the 50 p.ct. difference between 1d. and 1½d. is causing the consumer to pay more than is necessary, and that the producer is crippled by the reduced demand.

I do not think that this reason can be accepted, because money values fluctuate, as do also, of necessity, the costs of production. The law of supply and demand also affects value; and the very increase in the value of the penny itself would increase the selling-price of commodities which can be economically sold to-day at our present penny, so that to put this proposal into operation would only exaggerate that vicious circle to which there is no finality, but which is always increasing. It is claimed for the higher-value penny that present penny-basis contracts could be maintained by deducting one-sixth from the number of pence now paid. How would you like to have to do this when making your purchases? National insurance schemes, which are based on premiums paid in pence and benefits paid in shillings, would not, under my proposals, be affected, for both the pence and the shillings would simply be reduced to cents. There would be no alterations in values at all. After the recent Decimal Metric Congress in July, a letter was issued to the Press advocating, as the unanimous recommendation of the congress, that the value of the penny should be altered, making it ten to the shilling instead of twelve.

The following instance was given of a man's wage:

With present coinage,

47 hours at 1s. 9d., or 21d. . . . . 82½s.

The way with the higher value penny would be:

47 hours at 1s. 7½d., or 17½d. . . . . 82½s.

My way would be:

47 hours at 42 cents . . . . . $19.74.

You will see from these illustrations that, if either of the two suggestions was adopted, one would have to think in other terms; but I argue that it would be easier to realize that 21d. = 42 cents than that 21d. of old money would be 1s. 7½d., or 17½d. in the new money, and arrive at this by deducting one-sixth from the value of the old money. It would become second nature to express certain values in either £ s. d. or dollars and cents. How do I

remember that a £5 note at $4.86½ = $24.33, or that £2 10s. = $12.16? Simply because, when in Canada twenty years ago, I had necessity to use this calculation to enable me to judge values, and it has remained in my memory ever since. For instance, under my proposals, in this country it would be exceptionally easy to remember whole numbers such as the following:

£ s. d.	$	$	£ s. d.
0 10 0	2.40	3.00	0 12 6
1 0 0	4.80	6 00	1 5 0
1 10 0	7.20	9.00	1 17 6
2 0 0	9.60	12.00	2 10 0
2 10 0	12.00	15 00	3 2 6
3 0 0	14.40	18.00	3 15 0
3 10 0	16.80	21.00	4 7 5
4 0 0	19.20	24.00	5 0 0
4 10 0	21.60		
5 0 0	24.00		

In reckoning the instance given of a man's wages at 47 hours at 42 cents, it would be the simplest thing on earth to remember that £4 = $19.20, leaving a difference of 54 cents, or 27d.

The beauty of the whole thing would be that such conversion would only be of a very temporary nature, for it would surprise all doubters as to how quickly we should be thinking in the new terms; and I strongly advocate that it is easier to think in new terms than in new values. At present, every working man carries a ready reckoner to reckon out his pay; and I suppose that when changing over we would all have a simple little table available for reference.

In conclusion, let me say that I do not claim to be an expert on decimal coinage. I am merely presenting to you some ideas which have been at the back of my mind. It has never been my intention to give you a long or a comprehensive paper, but just to put my thoughts to you as clearly as the limited time I have had available for the preparation of my paper would permit; and I trust that they are so expressed as to encourage, stimulate, or provoke (as the paper may merit) a free discussion. I understand that some of our friends of the Decimal Association are present with a view to taking part in the discussion, and I hope that to such experts my efforts are of sufficient merit to warrant either their meed of praise or their measure of castigation. I welcome the severest criticism; for, though it may knock me completely out of the ring, I shall have learnt something of value in connection with this complex question. If I have not succeeded in furthering the progress of decimalizing our coinage, I do at least hope that I have succeeded in awakening some interest which has hitherto lain latent.

Discussion.

The PRESIDENT (Mr. D. Milne Watson) said he had pleasure in calling upon Sir Napier Shaw to open the discussion.

Sir NAPIER SHAW remarked that when he was invited to attend the meeting he wondered what aspects of the metric system would be disclosed by the address. He rather expected to hear what would be the effect on the penny or the shilling in the slot meter. He had, however, found in the address no special reference to this particular point of view. Mr. Drake, in dealing with the metric system, alluded exclusively to the coinage; it was the decimalization of the coinage which really came up for consideration. The metric system was, of course, much larger than this; it dealt also with weights and measures, &c. But confining himself now to the monetary aspect, he would like to explain why he supported decimalization of the coinage at whatever initial cost the operation might be undertaken. Sooner or later, if they lived long enough, they were certain to come to decimals. It was ultimately the natural way of expressing things; and this being so, they had better adopt the system as quickly as possible, and not put it off until they were actually overwhelmed by the pressure of circumstances. If, however, they adopted the metric system, he would like to suggest that they should do it with as much intelligence as they were capable of. Mr. Drake had referred to the proposal of Mr. Allcock, of the Decimal Association, to begin the introduction of decimals into the coinage by dividing the shilling into ten greater pence. This was a very easy step. The reasons for it he could not set out in detail, but they were so set out at the conference during the British Empire Exhibition; and Mr. Drake had to a certain extent represented them. It was not only the depreciation of the currency that had taken all the life out of the penny, but also the increase in the price of goods. There was no doubt that at the end of the war some re-determination of the penny would have been highly desirable; it had lost its meaning. If opportunity had been taken of that occasion to introduce a new value for the penny, it would have been of great benefit to the country, and in that way to the whole world. The opportunity was at that time neglected; but still there remained a great deal of dislocation of the value of the penny, which would never be restored. It was true that the purchasing power of the penny might rise to a certain extent, but no one could expect it to reach again the level at which it stood before the war. Referring to the suggested alteration of the value of the penny, the author had said: "Supposing this system were put into operation, I ask you what relationship does our coinage then bear to that of any other nation with whom we do business?" He was not sure what Mr. Drake actually meant by "nation." Of course, there were Australia, South Africa, the West Indies, and a number of overseas possessions which used the same coinage as this country; and if they might be called "nations," their coinage would still be in relation to that of this country. If it was decided to change the coinage here, it would be absolutely necessary to take these other places into consideration in determining what alterations should be made. The conclusion of the conference held last July was that the simplest plan of introducing the decimal system would be the decimalization of the shilling. They were waiting for some one to suggest a name which would connote the one-tenth of a shilling; "greater penny" or "larger penny" was rather long. As to Mr. Drake's proposal, this, he took it, was nothing more or less than to adopt the American system of dollars and cents; and this involved the introduction of dollar bills. Well, he had just returned from Canada, after having seen some dollar bills which one would suppose, judging from the wealth of soil they carried, were printed about the year 1800. He came back rather impressed with the advantages of that silver which Mr. Drake found so uncomfortable in his pocket. Perhaps the silver was in reality equally dirty, but it did not strike one as being so. Again, the adoption of Mr. Drake's proposal would be a much greater undertaking than decimalizing the shilling. It was suggested that it would save making new coins, but he thought further reflection would show that the coinage would have to be changed.

Mr. A. J. STUBBS congratulated Mr. Drake upon the clarity and conciseness of his address. He had given them an excellent example of the correctness of the old tag that "words are given us to hide our thoughts," for he felt sure that none of them, from the title adopted for the address, thought they were going to have a dissertation on decimal coinage. Undoubtedly, the statement he had made was exceedingly well balanced and very fairly put. In dealing with this subject of decimal coinage, they seemed to be faced with the almost insuperable difficulty that they were mostly agreed upon its necessity. If they could only make it a "party" question, it could be easily solved. If, for instance, Mr. Drake, as advocate of a dollar basis, were a Conservative, and he (the speaker), as an "£ *s. d.* Decimal" man, were Labour, they would be quoting in dollars next year, and if he (Mr. Stubbs) were Conservative, and Mr. Drake Labour, they would find that ten pennies would make a shilling in a few months. But because not only a good half of the community, but nearly the whole of it, wanted decimal coinage, they could only agree to fight over details. Now in 1917 the Decimal Association went into the question most carefully, consulted all sorts and conditions of men, put out a very fair statement on the relative merits of dollars and pounds sterling (he believed Mr. Harry Allcock was himself disposed to favour the dollar), and found that the case for retention of the pound was too strong to be rejected. This led to the Royal Commission of 1920. At the recent Metric Decimal Conference, Mr. Harold Cox, who signed the first minority report of that Commission, said he believed that if Mr. Harry Allcock's ten-penny shilling scheme had been before that Commission, it would have been accepted. Mr. Drake sought to make the best of both worlds—the "old" and the "new." It would be like being in this country and in New York at the same time. They would be numismatic bi-linguists. The author then went on to picture people with pockets bulging with the silver and copper change from numberless 10s. notes—never dreaming of paying 5s. 6d. in silver, so long as they had a 10s. note in their case. Of course, one got used to anything in time, but he must confess that the first time he saw a huge roll of dirty dollar bills in the hands of a tram conductor in New York, he determined to seek to make the exchange of dollar bills towards the conductor, and not from the conductor to himself. But fancy getting a roll of dollar bills from the Borough Market! He wished that Mr. Allcock could have been there that day, but unfortunately he was abroad; and as he (Mr. Stubbs) would probably have the honour of succeeding him as Vice-Chairman of the Decimal Association, it rather fell to him to defend Mr. Allcock's scheme. He ventured to think that there was really more in Mr. Allcock's increased cost of living argument than Mr. Drake seemed inclined to recognize. Could they view with equanimity the dominance of the nickel 2½d. as the minimum bus or tram fare, as it was in New York, or the risk one would run in giving less than 10 cents as a "tip"? He quite agreed that the present unsuitable condition in regard to prices was not fundamental, but the contention was that the stable condition would be arrived at long before they got the old pennyworth for a penny of the old value. The fact was, whatever coins of the realm might be issued, prices must, and would, adjust themselves fairly equitably through the law of supply and demand. He submitted that they were generally agreed a decimal coinage of some character was desirable; that the least change in the coins that was possible would be a great desideratum; that the banks and the Chambers of Commerce were bound to have considerable voice in the selection of a system; and that hitherto at least those authorities had been strenuously opposed to any system that had not the pound sterling as its primary basis. In these circumstances, he thought it was extremely improbable that they would ever be able to secure the introduction of the dollar as the standard of their coinage, and that the Decimal Association's present scheme went a long way towards meeting the case.

Mr. A. GORDON KING (New York), as one somewhat accustomed to these "dirty dollar bills," said he did not quite understand the point of view of the speakers. In America, the bigger the roll they got the better; the dirt did not matter. The bills purchased as much when dirty as they did when they were clean. Though he was brought up in England, he was now worried with the coppers over here. It seemed to him that he got just as dirty English pound notes in his pocket book here as he did dollar notes in New York.

Alderman F. TEMPLER DEPREE said his regret was that the criticisms of the address had not been a little more emphasized. He came to the meeting with a very strong feeling that he would like to say a good deal not in agreement with the address. He had had the opportunity of attending the meeting of the Decimal Association last July, when Mr. Allcock's suggestion with regard to the alteration of the penny seemed to him by far the most desirable one that had been made. However, he had been associated more or less with the metric system for the last thirty years, and they did not seem to have got a bit further on in all that time. At the Decimal Association meeting in July, they had among them a very go-ahead American, Mr. Gordon Selfridge, who pointed to the want of "go" and "push" over here regarding the matter. Mr. Selfridge attributed the failure to get results more particularly to the fact that none of the Governments in this country had ever taken up the question with any idea of carrying it through. He (the speaker) thought no Government of the past thirty years had had the courage to face it.

Mr. DRAKE said the trouble people had been up against in their efforts to decimalize the coinage was how to reconcile values. He had shown how it could be done. It hardly seemed to him that the dirty state of dollar bills was a sufficiently strong objection to prevent their introduction. There was a method of cleaning bills in operation now. He thanked Sir Napier Shaw and Mr. Stubbs for their remarks.

THE NEW MORRISTON WORKS AT SWANSEA.

[Presidential Address of Mr. W. H. JOHNS, M.I.Mech.E. of Swansea, before the Wales and Monmouthshire District Institution of Gas Engineers and Managers, Nov. 19.]

In the first place I should like to express my sincere thanks for the honour you have conferred upon me by electing me President of the Wales and Monmouthshire Institution of Gas Engineers and Managers for the ensuing year.

I am fortunate in being able, by the kindness and courtesy of the Directors of the Swansea Gas Light Company, to invite you to be present to-day at the inaugural opening of the Company's new works at Morriston; and it is therefore appropriate that my address should be confined to a résumé of the history and progress of the Company, and to a description of the new works which I have had the privilege to design and erect.

The Swansea Gas Light Company was established in March, 1821, commencing its useful service with a works in Dyfatty Street. In the Art Gallery of the Royal South Wales Institution at Swansea (where this meeting is being held) hangs an engraving dated 1822, which shows the lighthouse on the western pier of Swansea Harbour as being lighted by gas; the jets being fitted on a base arranged in the form of an anchor. It is satisfactory to learn also, from a copy of a description of Swansea and its environments printed in 1826, that "the whole of the town is extremely well lighted with gas." The lighting of the lighthouse must have given every satisfaction, because the same chronicler says: "Register pilots are appointed, and a lighthouse erected on the Mumbles Head and also on the western pier, the former serving as a general guide to the channel, and the latter to the pier and harbour, and splendidly lighted with gas."

The President, Mr. W. H. JOHNS, M.I.Mech.E.

Mr. Johns commenced his career in the gas industry with Messrs. West's Gas Improvement Company, leaving them to take an appointment as Assistant to Mr. C. Stafford Ellery, at Bath. Subsequent appointments were Assistant to Mr. F. J. Bywater at the Saltley Works of the Birmingham Corporation Gas Department, Gas and Electrical Engineer & Manager at Malvern, Engineer and Manager at West Bromwich, and Chief Engineer to the Sheffield Gas Company. In 1919 he was appointed Engineer and Manager to the Swansea Gas Light Company. He is an Ex-President of the Midland Junior Gas Association.

In 1830 the Company was incorporated by Act of Parliament. The preamble of this Act states that "certain persons had already subscribed for or contributed to, and expended considerable sums of money in the erection of, works and buildings, and in laying down mains and pipes in the said town of Swansea, for the manufacture and conveyance of gas, amounting in the whole to the sum of six thousand pounds." The privileges, obligations, and limitations respecting the activities of the Company were set out in great detail; and by this Act the Company became "one body politic and corporate, by the name of The Swansea Gas Light Company, with a common seal."

At this time gas meters were not in general use, and the provisions governing the supply of gas to private consumers were based upon contracts between the Company and the consumer. The only limitation as to price provided by the Act was in respect of gas for street lighting; the Company being "directed and required to supply such public lamps which they shall so contract to light, with gas of such quality as shall at all times afford a cheaper and better light, in proportion to the quality and intensity thereof, than would be obtained from oil lamps."

Little difficulty is presented in following the history of the Company from 1830, as the books and records yield abundant matters of interest. One of these old records gives details of the original contracts for the supply of gas. The consumer, on signing the contract, was regarded as an annual consumer; payment being made either quarterly, half-yearly, or in advance, at the option of the Company. A schedule of prices was drawn up, and provided the public with alternative charges, as follows:

Period of Lighting Hours.	*Price per Annum per Burner.*		
	£ s. d.	£ s. d.	
From dusk to 10 p.m. . . .	1 3 6	to 4 8 0	according to the type of burner.
,, ,, ,, 11 ,, ...	1 3 6	to 5 4 6	
,, ,, ,, midnight . . .	1 13 0	to 5 19 0	
All night	2 15 0	to 8 16 0	

In 1840 the Company found that the then existing works at Dyfatty Street were not of sufficient capacity to meet the ever-increasing demand for gas; the site being unsuitable for extension. Accordingly, a site on the Burrows was obtained; and the new works built there formed the nucleus of the present works at Oystermouth Road. Gas making commenced here apparently in 1841; and in 1842 the Dyfatty Street station was sold. The registration of gas was now becoming more prevalent; and in 1841 it was resolved that in future gas should be sold only by meter, the price being 10s. per 1000 c.ft.

From the date of its original charter of 1830 the undertaking has had a continuous record of progress, the increasing demand for gas necessitating from time to time the installation of additional gas producing and distributing plant and apparatus. Such extensions naturally demanded additional capital, and on various occasions the Company have sought further statutory powers. The figures on the following page clearly indicate the Company's growth.

The expansion of the Company's activities was rapidly outstripping the resources of the Oystermouth Road Works, and as far back as the year 1911 the Directors considered the question of obtaining a further site for the erection of new plant, as no economical or practical reconstruction scheme could be devised to meet the exigencies of the situation. Accordingly, in 1912 they were authorized by Act of Parliament to acquire new lands at Morriston for this purpose.

—	1856	1906.	1913.	1923.
Capital, share and loan .	£29,766	£367,308	£425,011	£854,563
Gas made, c.ft., millions.	12	420	591	795
Number of consumers .	606	14,123	22,639	27,087
Gas cooking stoves . .	..	6,606	9,790	11,929
Public lamps	231	1,981	2,743	2,998
Mileage of mains . . .	15	105	133	151

The preparations made in 1914 for constructing the new works were postponed by the outbreak of war; and at the time of my appointment to the Company, in September, 1919, the work in progress consisted of filling in and levelling the site, the formation of a railway embankment, and the construction of a reinforced concrete foundation slab for a 2-million capacity spiral-guided gasholder with steel tank, the contract for which had already been placed. The purchase of further plant was wisely deferred by my Directors during the abnormal period immediately following the war, when the prices of both labour and materials were at their maxima; and it was therefore not until the end of 1922 that the Directors resolved to proceed with the erection of a retort-house and carbonizing plant of a capacity of 3 million c.ft. per diem, complete with the necessary auxiliary plant. The scheme provided for the erection of water gas plant immediately the coal gas section was completed, and for the ultimate abandonment of gas manufacture at the Oystermouth Road Works, which are to be retained as a distribution station and central stores. Meanwhile, alternative schemes had been devised and considered, estimates prepared, and application made to Parliament for—*inter alia*—power to raise the requisite capital.

The enforced postponement of the erection of the new works at Morriston necessitated temporary measures being taken to maintain an adequate supply of gas at the old works at Oystermouth Road and without undue capital expenditure. It was essential to carbonize better-class coals, which was the means of substantially increasing the output of the inclined retort house; and in turn this increased make of coal gas enabled a proportionately higher volume of water gas to be added. Even so, it has been necessary to employ all available plant during the heavy winter load period, when the daily output exceeds 3 million c.ft.; and often no little anxiety has been occasioned as to whether the plant would be capable of meeting the demand.

Our difficulties were not confined to gas making proper. The washing and scrubbing plant was only of 2 million c.ft. per diem capacity, and as formerly the exhausters were common to both coal gas and water gas, the mixed gas passed through this plant. A separate water gas exhauster was installed, and the old ex-

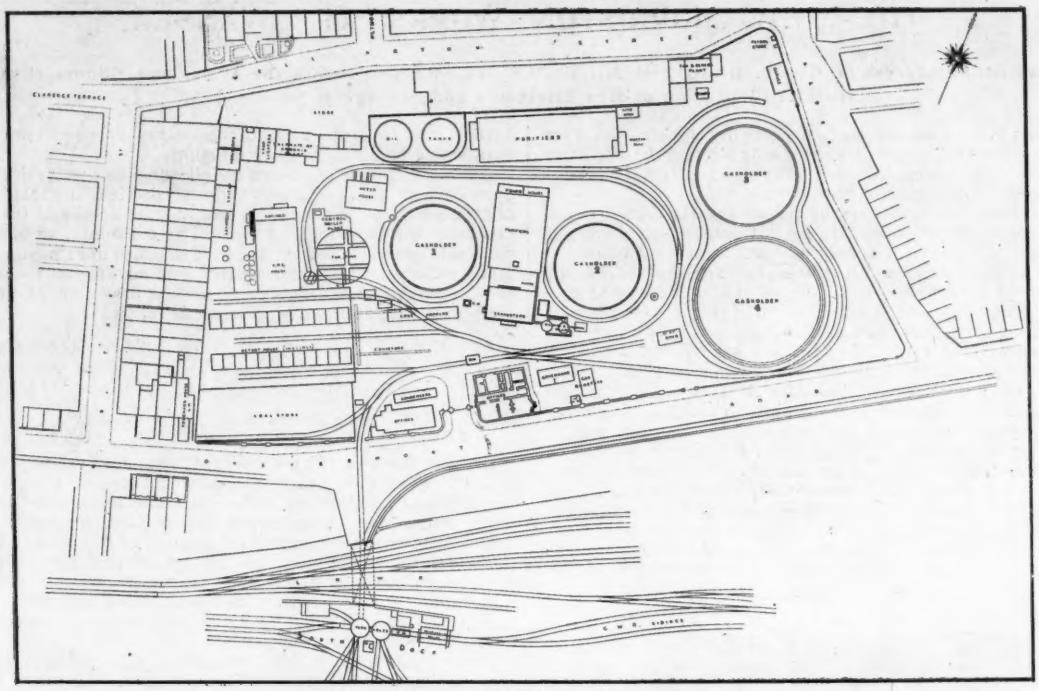


FIG. 1.—THE OYSTERMOUTH ROAD WORKS.

hausters were arranged to deal with the coal gas only. We were thus enabled to introduce the water gas to the coal gas at the outlet of the washing and scrubbing plant, so relieving the latter of the make of water gas, reserving the plant to deal with an increased volume of coal gas, and thereby improving its efficiency. At the same time this arrangement facilitated easy regulation of the flow of water gas from the relief holder, consistent mixing of the two gases, and better control of both retort-house and water-gas plant.

The purifiers were of inadequate size, and efficient purification could only be effected by frequent changes of the boxes. While this was expensive, no other course was possible without incurring capital expenditure. It was also necessary to instal turbine boosters to increase the pressure of gas, in order that the lower lifts of the holders might be utilized. In the case of outlying districts, duplicate gas compressors were installed to ensure the minimum pressure prescribed by the Gas Regulation Act being maintained during periods of maximum demand; these compressors ultimately serving the dual purpose of reinforcing district pressures and of compressing gas to the Morriston holder through a 12 in. high-pressure connecting main which was completed in July, 1923. By this time the Morriston governor house and station governor were also completed, and the holder was utilized to distribute gas to the northern districts of the town. The lay-out of the Oystermouth Road Works is shown in block plan in fig. 1. It will readily be seen that no practical extensions could be undertaken to meet the large increased demand anticipated.

MORRISTON WORKS.

The Morriston Works are shown in plan in fig. 2, and the carbonizing plant and coal and coke handling plant in cross-sectional elevation in fig. 3. I should like to record the following characteristics of the works before proceeding to a more fully descriptive recital:

The works are laid out for an ultimate capacity of 12 million c.ft. of coal gas per diem, and 6 million c.ft. of water gas. In designing No. 1 section, the requirements of No. 2 section in regard to subsidiary plant were duly considered; and wherever expedient, plant and buildings have been constructed sufficiently large for such future requirements. Further expenditure on machinery for coal stocking and coke handling will not be necessary when the second carbonizing unit is erected, as the cranes installed for these respective duties are adequate to meet the requirements of two retort-houses, each of a capacity of 3 million c.ft. per diem. The coke crane, travelling on a reinforced concrete gantry is very flexible in its operations. The coke storage hoppers, yard heap water gas plant, boiler plant, and coke separator are all set-out within its radius. Transport of all coke, breeze, and ashes may therefore be undertaken by the crane without recourse to separate means of sectional transport.

The horizontal retort house is worked on the two-shift principle with a 4-hour interval between each shift; the duration of the charges being twelve hours. The boiler-house chimney stack and main flues have been constructed sufficiently large for the duplication of the boiler plant. The engine and power house is comprehensive in lay-out and, centrally situated, is constructed for the reception of:

(*a*) The electrical generators, exhausters, and pumps incidental to two carbonizing units.

(*b*) Gas compressors necessary to feed the holders at the Oystermouth Road Works through the 12-in. high-pressure connecting main.

(*c*) The exhausters required for the ultimate maximum make of water gas.

(*d*) The tar and liquor pumps incidental to two carbonizing units each of 3 millions a day capacity.

The existing machinery is installed in duplicate, and an additional set of each of the respective units will be added when No. 2 retort-house is constructed. The advantages of concentrating the whole of the machinery in the one building will be apparent.

The ammonia and naphthalene washer-scrubbers have been erected in one group, with common duplicate engines, either of which is capable of driving both washers. The connections are arranged so that the extraction of naphthalene is effected after purification. The purifiers—of large area—are erected in the open at ground-floor level. The arrangement of the valves and connections will curtail changes of purifiers to such an extent that handling of oxide will be infrequent, and in these circumstances it was considered inadvisable to instal the expensive machinery usually associated with the filling and unloading of oxide in the purifiers. The tar and liquor storage wells have been designed to carry large stocks. This will enable the tar dehydrating and sulphate of ammonia plants to be worked intermittently, and will render the respective attendants available for other duties during the interim.

SITE AND FOUNDATIONS.

The site of the Morriston Works consists of fairly flat marsh land in the valley of the River Tawe midway between Morriston and Llansamlet. A geological report states that the valley was formed during the glacial and post-glacial period when the ice from the high plateaux of Brecknockshire descended the Neath and Tawe Valleys to the sea. The depth of superficial deposits varies considerably in the Tawe Valley. In one place the glacial formation is over 300 ft. thick, and in coal pits not far removed from the gas-works site the rock of the upper coal series and the Pennant series have been encountered at depths varying from 50 to 60 ft. Another report, describing the sinking of a shaft in this district in 1863, states that "the tract contains a bed averaging about 60 ft. deep of clay, quicksand, and alluvial soil. It is supposed that this was once a lake; and this is probable, as old trees and other similar remains were found at a depth of 20 ft." The site was surveyed in every detail; and systematic boring revealed the nature of local subsoil. The boreholes indicated that the prevailing strata were mud, sand, and ballast, and blue boulder clay of uneven thicknesses. As the ground was waterlogged for practically the whole of the year it was necessary to fill-in to an average depth of 7 ft., making the works datum level 26 ft. above ordnance, and equal to the level of the main line of the London, Midland, and Scottish Railway. The position of the works relative to the growing industrial districts of Swansea is all that could be desired, but it will be seen that the site was not an ideal one for the erection of a modern gas-works.

The foundations consist of reinforced concrete slabs strengthened where necessary by beams, and supported on piles. The varied nature of the subsoil made pile-driving really difficult, as it was not possible to formulate any definite programme in regard to length of piles. Four test piles were therefore driven on the

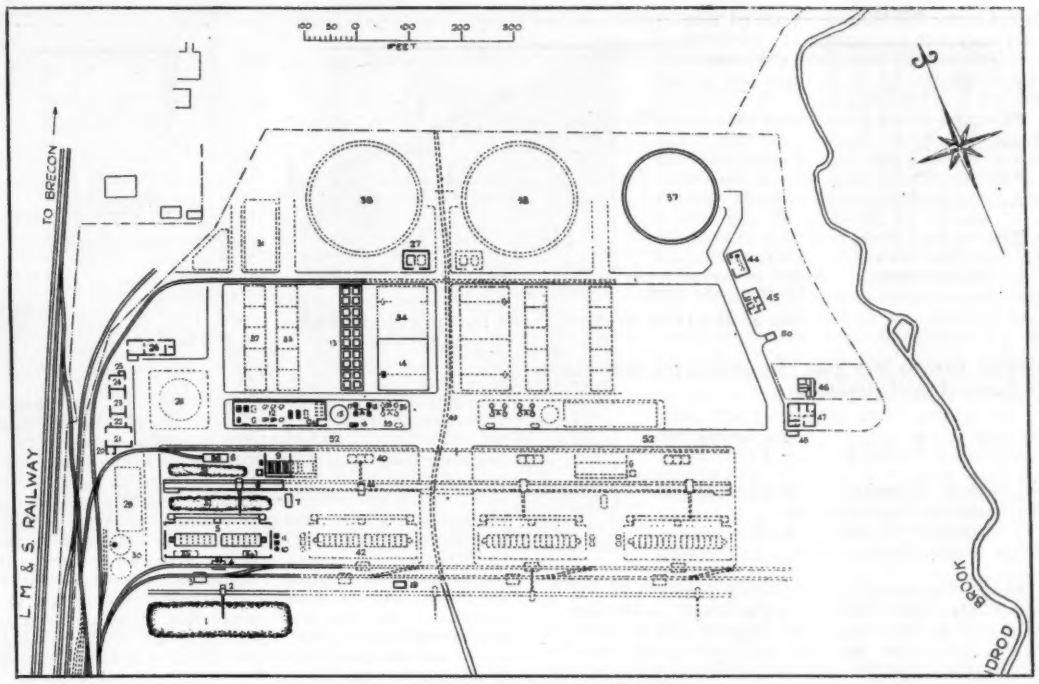


FIG. 2.—THE MORRISTON WORKS.

Key to Block Plan, Fig. 2.

1. No. 1 section coal stack.
2. No. 1 coal grabbing crane on rails (for Nos. 1 and 2 sections).
3. No. 1 section coal grabbing pit—coal to stock.
4. No. 1 section coal breaker pit.
5. No. 1 section retort house—3 million capacity per diem, with coal and coke handling plants.
5a. Stokers' messroom.
5b. Stokers' lavatories.
6. No. 1 section coke crane running on reinforced-concrete gantry.
7. "Columbus" coke separator.
8. No. 1 section coke storage hoppers.
9. No. 1 section boiler-house prepared for reception of No. 2 section boilers.
10. No. 1 section cyclone tar extractor.
11. No. 1 section water-cooled condensers.
12. Engine house containing No. 1 section electrical generating sets, exhausters, compressors, tar and liquor pumps, and prepared for No. 2 section sets.
12a. Foreman's office.
13. No. 1 section coal-gas purifiers.
14. No. 1 section tar and liquor wells with separator.
15. Elevated water tank.
16. No. 1 section Livesey washer.
17. No. 1 section ammonia washer-scrubbers.
18. No. 1 section naphthalene ,,
19. Water sump.
20. Oil stores.
21. General stores.
22. Carpenters' shop.
23. Machine shop.
24. Blacksmiths' shop.
25. Lavatories.
26. Sulphate of ammonia plant.
27. Meter house containing No. 1 section meter and prepared for No. 2 section meter.
28. Future C.W.G. relief holder.
29. Future C.W.G. plant.
30. Future oil tanks.
31. Future tar dehydrating plant.
32. Future C.W.G. purifiers.
33. No. 2 section future purifiers.
34. No. 2 section future tar and liquor well with separator.
35. No. 2 section future ammonia washer-scrubber.
36. No. 2 ,, ,, naphthalene ,, ,,
37. Gasholder, 2 million c.ft. capacity.
38. Future gasholders.
39. No. 2 section future Livesey washer.
40. No. 2 section future coke storage hoppers.
41. No. 2 section future coke crane and gantry.
42. No. 2 section future retort house with coal and coke handling plant.
43. Weigh-house and railway wagon weighbridge.
44. Governor house.
45. Laboratory.
46. Works Superintendent's residence.
47. Offices.
48. Road traffic weighbridge.
49. Culvert line.
50. Garage.
51. Coke storage on yard.
52. Main works avenue.

site of the retort-house, and as satisfactory sets were obtained at a depth of 32 ft. below datum, piles of this length were cast. Unfortunately, however, in actual practice many piles were not satisfactory at 32 ft. These were "rested," and in many instances improved and reliable sets were recorded immediately after re-driving. This improvement suggested that the piles had been driven into layers or pockets of fine sand which, rendered soft during the process of pile driving, had consolidated when the piles were at rest. Only when the improvement was retained over 20 to 30 blows of the "monkey" of the pile driver, however, were the piles approved. Where satisfactory sets were not recorded after "resting," the piles were lengthened; and for this purpose "Ciment Fondu," a quick-hardening aluminous cement from the Lafarge Works in France was employed, as the use of this cement enabled driving to be resumed within two or three days of concreting, whereas the application of ordinary Portland cement would necessitate a minimum period of six weeks for maturing. The ground was so bad, however, that many piles were unsatisfactory even after lengthening, and additional ones had to be driven.

Varying results were obtained in places only a few feet apart; and in this respect fig. 4, showing the bearing capacity at different levels of three piles driven for the purifier foundations, will be of interest.

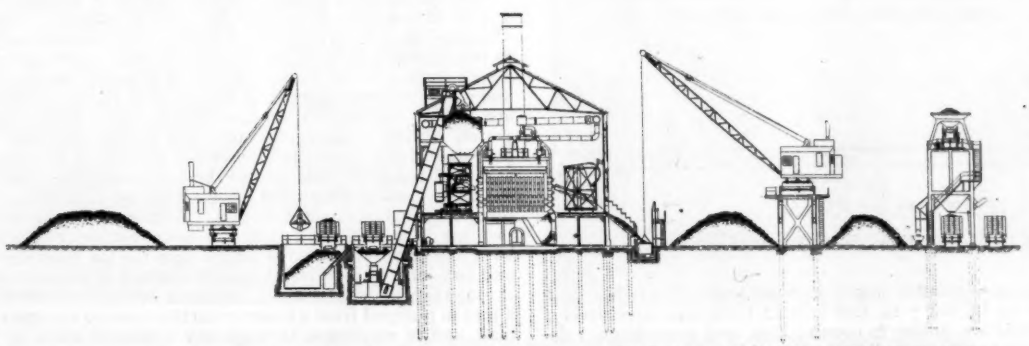


FIG. 3.—CROSS-SECTIONAL ELEVATION OF THE CARBONIZING AND COAL AND COKE HANDLING PLANTS.

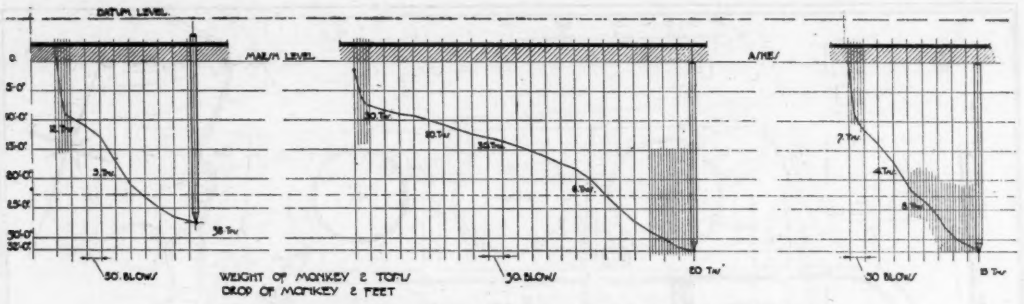


FIG. 4.—DIAGRAM OF TEST PILES FOR PURIFIER FOUNDATIONS.

The following formula was used to calculate the safe load L in tons, the factor of safety being 6:

$$L = \frac{2\,W\,h}{S\left(l \times \frac{W}{w}\right)}, \text{ where}$$

h = drop of monkey of pile driver in feet.
S = set per blow in inches.
w = weight of monkey in tons.
W = weight of pile in tons.

As many as 853 piles were driven, totalling in length 26,300 ft. or nearly five miles. They carry the loads directly in the case of the coke crane gantry, the coke storage hoppers, and the elevated water tank; but in all other instances the loads have been distributed by reinforced concrete slabs strengthened where necessary by beams, the whole foundation being monolithic in construction. In designing floor slabs, bending moments have been found by the application of the theory of three moments, sufficient reinforcement being provided to meet the negative moments over supports, as well as the positive bending moments at the middle of the spans.

The retort-house foundation (the first to be constructed) supports a total load of approximately 10,000 tons. The chimneys, each of which weighs 167 tons, impose the heaviest concentration of loads, and with the retort bench are supported by a slab 15 in. in thickness; the surrounding slab being reduced to 6 in. The upper and lower floor slabs of the engine house (fig. 5), which are

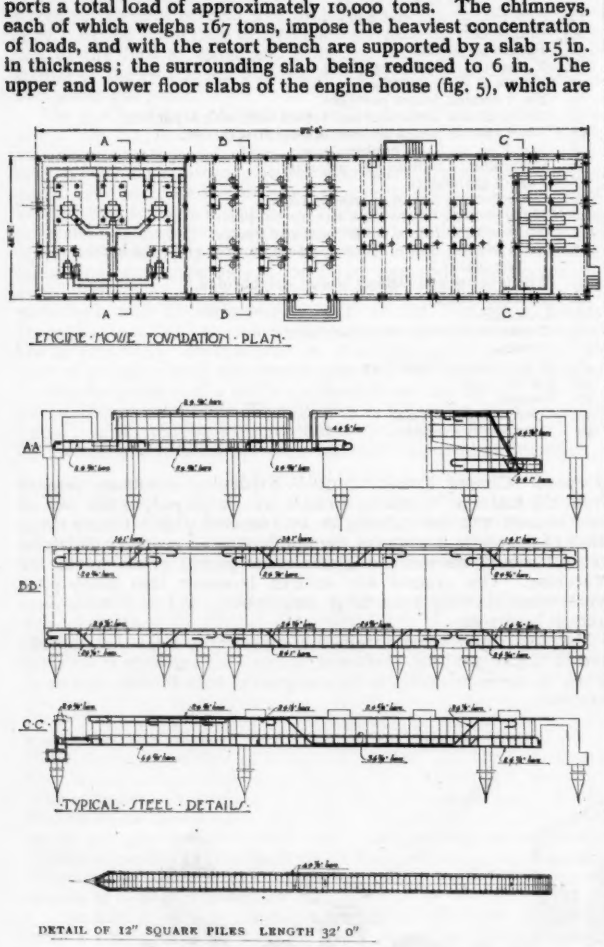


Fig. 5.—Engine House Foundation Plan and Details.

designed to carry relative super-imposed loads of 400 lbs. and 200 lbs. per sq. ft., are 7 in. and 6 in. in thickness respectively. All foundations are similar in construction, and accordingly I do not propose to occupy your time in describing them further.

COAL TRAFFIC AND STOCKING.

Gas undertakings have been obliged only too frequently during recent years to deplete standing stocks of coal during periods of industrial unrest. The charges in so doing, and in restoring the depleted stock to normal proportions in the least possible time when regular deliveries have been resumed, have been considerable; and it was with the object of reducing to a minimum such charges that a crane and grab of large capacity were installed (*a*) to put coal to stock, and (*b*) to remove coal from stock direct to the breaker pit. This system has many advantages. It is rapid and economical, repair and maintenance charges must of necessity be low, and the stocking of various classes of coal in separate sections of the open stack is possible. The loaded coal wagons are hauled from the main sidings to the retort-house siding by means of electrically operated capstans, and discharged by hydraulic tipplers into a grabbing pit or a breaker pit for stocking or carbonizing respectively. The steam crane (see fig. 6), travelling on an 8 ft. gauge rail, operating the grab, removes the coal from the grabbing pit to the heap stack, which is parallel to the retort-house. The crane is capable of dealing with 280 tons of coal in a working day of seven hours at twenty cycles per hour. It has relative maximum and minimum radii of 50 and 20 ft., and, as previously stated, will be sufficient for the requirements of an additional carbonizing unit.

Both the coal crane and the coke crane (referred to later) were manufactured by Messrs. Stothert and Pitt, Ltd., of Bath.

CARBONIZING PLANT.

The selection of carbonizing plant naturally occasioned considerable thought and lengthy discussions with my Board. The comparative advantages of both horizontal and vertical retorts were duly analyzed, modern installations inspected, and reports upon their working carefully studied. The industry is indebted in no small degree to its larger undertakings for their interesting pioneer and experimental work; and as a result the merits of these respective systems of carbonizing have been given much publicity in recent years. Opinions are divided as to which is the more profitable method; and while vertical retorts have their adherents, many engineers have lately favoured large machine-operated horizontal retorts worked on the two-shift principle.

Local conditions undoubtedly influence choice of plant, and in our case governed our ultimate decision to instal horizontal retorts and separate water gas plant. The requirements of our coke consumers were not overlooked. The demand is for a large coke resembling in appearance that produced in an installation of coke ovens, and our experience has been that by restricting sales (using the surplus coke in the manufacture of water gas) better prices are obtainable, and the additional revenue from this source may be set against the higher make of gas in therms from vertical retorts.

Our declared calorific value is 450 B.Th.U., and it was considered that easier regulation of this quality is possible by the manufacture of a straight coal gas of high quality diluted to statutory requirements by an admixture of blue water gas made in a separate chamber. Furthermore, the manufacture of blue water gas is very economical. A fairly large proportion may be added to high-quality coal gas manufactured in horizontal retorts, and the net cost into holder of the final mixed product will compare favourably with the cost of gas made in other systems.

The retort-house is a brick-panelled steel-framed building, 204 ft. in length by 65 ft. span by 50 ft. in height. The retorts, of special ⌂ section, 24 in. by 18 in. by 23 ft. long, are constructed in two benches, each of seven beds of ten retorts in five tiers. Seven beds are set with moulded Stourbridge fireclay retorts, and seven beds with segmental Scotch silica retorts. The settings are heated by tubular regenerative furnaces fitted with step-grates. Ashes from the furnaces are loaded into light wagons provided with ball bearings, travelling on rails in the cellar floor, and discharged for treatment in the coke separating plant.

The hydraulic mains are 30 in. wide by 24 in. deep, and are formed in sections over each bed. Each bench is controlled by two sets of 12-in. Cowan's retort-house governors, and is provided with four tar towers, two of which take the tar from three beds and two from four beds. A special method of circulating liquor through the hydraulic mains has been introduced, whereby the liquor is pumped from a lower or suction tank to an upper or feed tank, and is circulated through the hydraulic mains to the tar towers, overflowing through the weir valves to the suction tank

Fig. 6.—Side of the Retort House, showing the Sidings and the Coal Crane for Putting into, or taking from, Stock.

The same liquor is circulated over and over again; liquor made is utilized to take the place of liquor employed in running off the tar towers, while surplus liquor overflows to the storage wells. The tar towers are periodically run off in such a manner that a steady hydraulic seal is maintained. By this method of circulation of liquor the mains are kept clear of pitch, and consequently "stopped pipes" are substantially reduced in number. Further, as the minimum quantity of liquor is employed to maintain the seal, the ammonia content must necessarily be conserved. The method was brought to my notice by Mr. Frank J. Pearce, who has applied it with excellent results at the Mill Hill Works of the North Middlesex Gas Company.

Two essential factors of the retort-house are the Drakes' combined charging and discharging machine, and the "G. N." hot coke transporter, both electrically driven. The Drakes' machine (fig. 7) is well known, and calls for little comment on my part. That at Morriston is the latest to be constructed; and a pleasing feature is the absence of dust when the retorts are being charged with the result that the atmosphere on the charging side is clear and good working conditions prevail. The machine will easily operate the 140 retorts comprising this installation—each retort being charged with 18 to 20 cwt. of coal—during a working shift of eight hours.

The "G. N." hot coke transporter (fig. 8) forms an important section of the system of coke handling. When it was originally introduced to me by Mr. R. E. Gibson, the Engineer to the Liverpool Gas Company (one of the patentees), I was immediately impressed by its high efficiency combined with simple construction It performs a dual function. First, it discharges the hot coke to the outside quenching bench, and secondly it is employed for producer charging. In this manner, working conditions on the discharging side of the retort-house are good, and much arduous manual labour is obviated. The machine comprises an outer frame or carriage running upon rails on the stage floor, carrying a steel tube slightly larger in section than a retort, either end of which may be elevated by means of wire ropes attached to a drum while the other end is at rest in a hinge or trunnion. When the outer end of the tube is in its lowest position, it communicates by means of a tail plate with the quenching bench; and the inner end may be hoisted to any mouthpiece, whence it receives the hot coke discharged by the Drakes' machine. The discharging ram of the latter does not enter the tube, which is left full of coke on the completion of the forward discharging stroke of the ram. From the two top tiers of retorts the coke passes directly through the tube to the quenching bench. When coke is discharged from lower tiers it is necessary to hoist the tube to such an angle that the coke will slide freely to the bench. Separate motors and control gear are provided for both the travelling motion and the hoisting of the tube. Clutches and interlocking devices enable either end of the tube to be lifted at will, but special arrangements are made so that it is not possible to lift either end unless the opposite end is resting in its fulcrum bracket.

For producer charging, the tube, filled with hot coke, is brought opposite the producer opening; and when the outer end is elevated the coke slides into the producer by gravitation, or aided when necessary by a ram incorporated on the transporter. It is also provided with a producer lid-lifting lever which enables a lid to be lifted, moved clear, and replaced by the operator from his platform. In no instance whatsoever does the coke come in contact with any wearing part, while the tube is specially designed to withstand long and hard wear.

COKE QUENCHING.

In considering the question of quenching, attention was paid to the Sulzer system of dry cooling, whereby the heat is recovered by the circulation of inert gases (generated by the contact of air with the hot coke in a special chamber) for the production of steam in waste-heat boilers. Partly on account of cost, however, this system was not adopted; and quenching is carried out on an inclined bench by the employment of well and waste water delivered at high pressure through swivelling ball nozzles on standpipes on a platform parallel to the bench. The surplus water, after quenching, drains into a reinforced concrete trough located between the bench and the platform. This trough, constructed in the form of a gentle convex, conducts the water to settling tanks at either end, whence it is returned to a common sump and reused for quenching purposes; electrically-driven centrifugal pumps being employed for this duty.

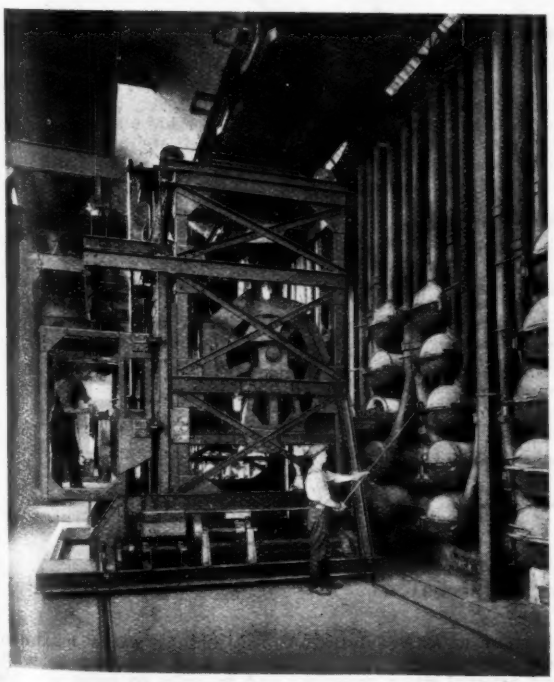


Fig. 7.—Drakes' Charger-Discharger.

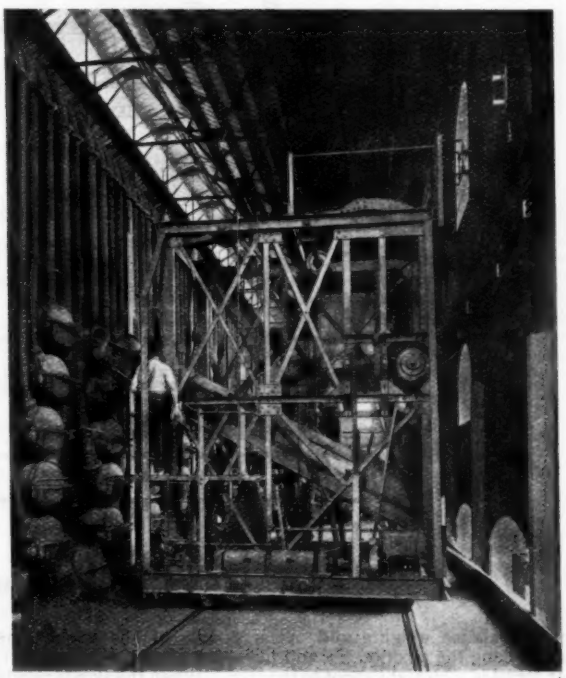


Fig. 8.—"G.N." Coke Transporter.

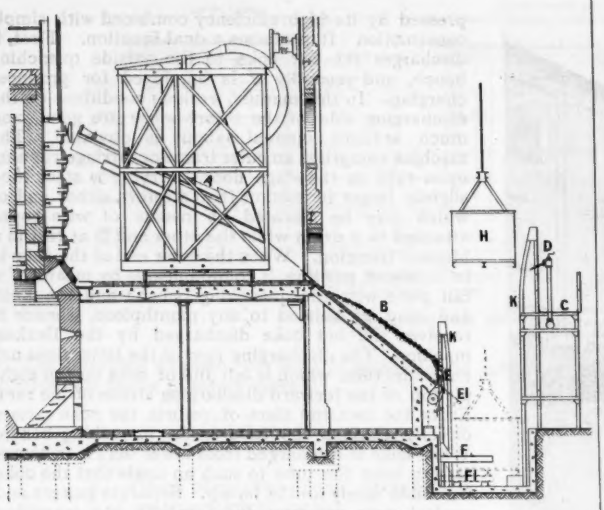


Fig. 9.—Coke Handling Plant.

COKE TRANSPORT.

Coke handling outside the retort-house is executed by a steam locomotive crane, fitted with a skip of a capacity of 2 tons, travelling on a 12-ft. gauge rail on a ferro-concrete gantry.

At this stage I should like you to refer to fig. 9, which shows the method of (*a*) discharging the hot coke from the retorts to the inclined bench, (*b*) coke quenching, and (*c*) loading into the crane skip.

The ram of the Drake's machine discharges the hot coke into the steel tube A of the "G. N." transporter, through which it slides to the inclined bench B, where it is quenched from the platform C by water delivered through the ball swivelling nozzles D at a pressure of 80 lbs. per sq in. A hinged plate E and a frame F are fixed to the bottom of each of the doors of the bench; the doors and frames being counter-balanced so that normally the doors are shut. The coke skip H is lowered by the crane between the guides K K to the frame F, where its weight overcomes the counter-balance weights and opens a door of the bench; the frame taking the position F1, and the shoot plate the position E1, thus forming a straight shoot to the skip. When the skip is nearly full, its weight is taken by the crane, and the door of the bench automatically closes by the action of the counter-balance weights.

COKE SCREENING.

Coke delivered to the storage hoppers is discharged into a receiving hopper feeding a Drake's patent cascade screen which diverts the coke into two outer compartments of the hoppers, and the breeze to an inner compartment. Storage is available for 120 tons of coke and 30 tons of breeze. Suitable shoots are fitted for loading railway wagons and road vehicles.

I have previously made a brief reference to the flexibility of the crane. The coke may be delivered from the quenching bench to the storage hoppers, to the yard heap, or to the water gas plant; and breeze may be loaded into the skip through a special shoot on the storage hoppers and conveyed to the boilers. Substituting a grab for the skip, coke may be delivered from the yard heap to the storage hoppers or to the water gas plant, and ashes may be conveyed from the retort-house dump or water gas plant to the coke separator. Comparatively little labour is involved throughout, repair and maintenance charges cannot fail to be low, little or no coke is lost through spilling, and the possibility of a breakdown is remote. The whole arrangement from mouthpiece to storage hopper ensures the most careful handling of the coke, and reduces breeze to the minimum.

FERRO-CONCRETE STRUCTURES.

The coal breaker pit is shown in fig. 10. A waterlogged subsoil rendered excavation a difficult matter; pumping was continuous, and the sides of the excavations had to be close-timbered. A subterranean passage provides quick and comfortable access to the coal breaker pit.

The coke crane gantry (fig. 11) is 232 ft. 6 in. over-all in length, and consists of ten bays and two overhanging platform ends. The structure is supported by 22 piles each 15 in. square, and carries a crane weighing 60 tons on a track of 12 ft. gauge. When the crane is fully loaded and the jib extended at right angles to the track, the load on the wheels of the crane at one side is 43½ tons. This highly concentrated rolling load necessitated the gantry's being well braced longitudinally; and while it is braced transversely at two bays only, the top slab, acting as a horizontal beam, distributes horizontal forces over all the piles. To reduce vibration to a minimum on a structure of this nature, subjected as it is to such violently fluctuating loads, a heavy mass-concrete slab has been constructed at ground level, with very satisfactory results.

The coke storage hoppers are supported by 12 piles each 12 in. square. The tar and liquor wells are shown in fig. 12. Provision is made for the storage of 188,000 gallons of tar and 396,000 gallons of liquor, equivalent to 9½ and 6¾ weeks' maximum make respectively. The wells have been designed to withstand external water pressure; and in order to resist possible flotation when empty, they have been made sufficiently heavy to resist the upward pressure produced by water. An elevated

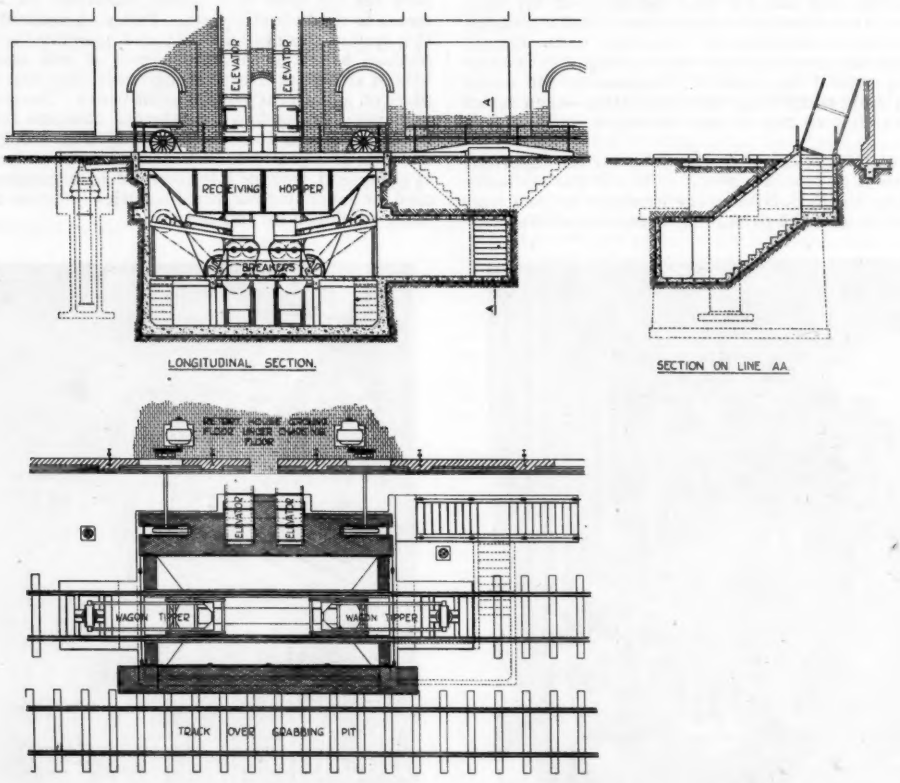


FIG. 10.—COAL BREAKER PIT AND APPROACH.

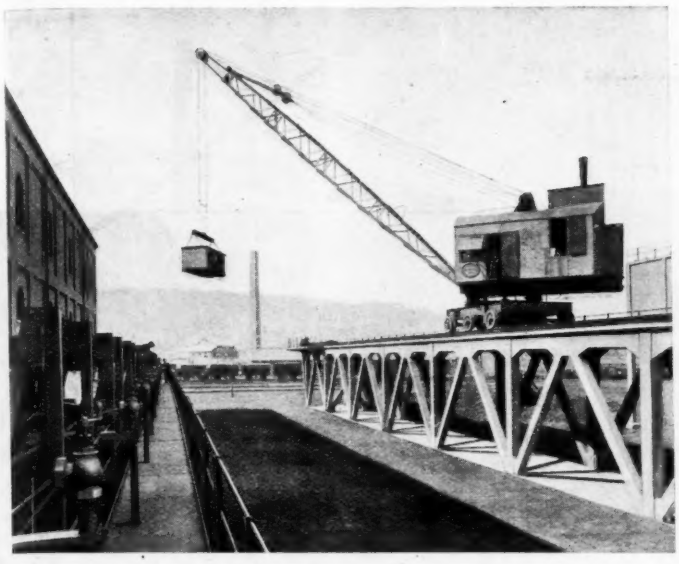


Fig. 11.—View of Coke Crane and Gantry, with Quenching Benches on the Left.

water tank having a capacity of 60,000 gallons, 57 ft. over-all in height, and divided into two separate compartments, each provided with visible gauges, has been constructed (fig. 13) in a central position.

SUBSIDIARY PLANT.

The boiler plant comprises two Babcock and Wilcox water-tube boilers, each having a heating surface of 2531 sq.ft., constructed to work at a pressure of 160 lbs. per sq.in., and provided with integral superheaters capable of imparting from 100 to 120° superheat to saturated steam. Two Weir type vertical single-cylinder direct-acting feed pumps, each capable of delivering to the boilers 2000 to 2350 gallons of water per hour, and a Holden and Brooke's patent high-velocity exhaust feed-water heater are also provided. The steam connections, in Mannesmann steel tubes, were erected by Messrs. Superheater Units, Ltd., of Swansea. A special main collects and conducts all exhaust steam from the engine-house to the feed-water heater.

The engine-house is 177 ft. 6 in. long and 46 ft. 6 in. wide. I have previously referred to its comprehensive lay-out (see also fig. 14); and the following plant has already been installed:

Duplicate 200-KW. electrical generator sets, D.C., 220 volts, for day load.

1 70-KW. electrical generator set, D.C., 220 volts, for night load.

Duplicate coal-gas exhausters, each having a capacity of 150,000 c.ft. per hour.

Duplicate reciprocating gas compressors, each having a capacity of 100,000 c.ft. per hour.

Tar and liquor pumps.

The installation of exhausters for water gas will be proceeded with early next year, simultaneously with the erection of the water gas plant itself. A double girder hand-propelled overhead travelling crane by Messrs. Herbert Morris, Ltd., is installed; and in order to ventilate the building with air freed as far as possible from dust, two 42 in. diameter propeller fans, by Messrs. James Keith and Blackman Company, Ltd., have been fixed to circulate air which is treated in special filtration chambers.

The gas, on leaving the retort-house, is immediately conducted to a cyclone tar extractor which is installed at the gable end of the retort-house immediately prior to the condensers. The water-cooled horizontal tube condensers are of the reversible type; and as construction is entirely in cast iron, a long life is ensured. A high-velocity water travel restricts possible silt or other solid matter deposits, materially increases the rate of transmission of heat, and correspondingly improves the efficiency of the plant.

The washing and scrubbing plant consists of a Livesey washer, a rotary brush ammonia washer-scrubber on the two-unit principle, and a naphthalene washer-scrubber. Both the ammonia and naphthalene washers are identical in design, and, as previously stated, they are erected in the same group with common engines, but the connections are so arranged that the extraction of naphthalene (using gas oil as a washing medium) is effected after purification. The whole of the condensing and washing plant was supplied and erected by Messrs. W. C. Holmes & Co., Ltd., of Huddersfield. The guarantees stipulate the production of 10 oz. liquor, and the reduction of the naphthalene content to 0·5 grain per 100 c.ft.

The purifiers, supplied by Messrs. R. Dempster & Sons, of Elland, Yorks, are erected in line in the open, and consist of five boxes, each 40 ft. square by 6 ft. deep. Each is fitted with four self-jointing steel covers; and a suitable dwarf cover-lifting apparatus, spanning the whole width of the purifiers and designed to travel the full length, is provided. The plant may be worked on the "upward and downward" or "forward and backward" rotation system, by the operation of the patent "reverser" valves (fig. 16), which, along with the connections, are located in an open trench, 10 ft. 3 in. wide, on one side of the purifiers. In the near future it is proposed to construct on the other side a revivifying floor covered with a light "Belfast" type roof; and a disintegrator for treating partially-spent oxide will be installed. The meter house has been designed to accommodate two station meters, each of a capacity of 150,000 c.ft. per hour. No. 1 meter was installed by Messrs. W. Parkinson & Co.

The sulphate of ammonia plant consists of a complete equipment for the production of four tons of dry neutral sulphate of ammonia per diem. The sulphate plant itself was erected by Messrs. W. C. Holmes & Co., Ltd. (the still being prepared for future extension to increase the capacity of the plant), while the neutralizing apparatus was supplied by Messrs. Hooper & Wey-

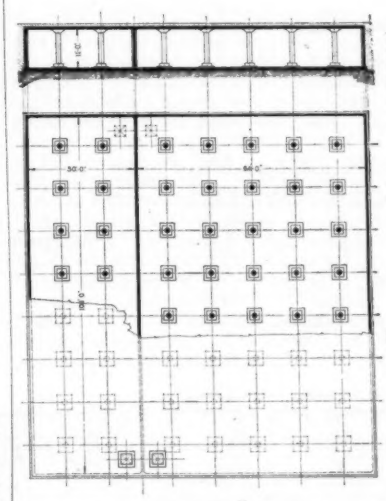


Fig. 12.—Details of Tar and Liquor Tank.

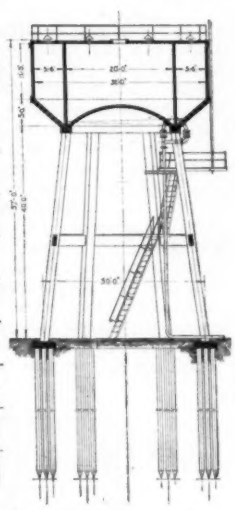


Fig. 13.—Details of Water Tank.

man, of Newcastle. Neutralizing is effected by a special feeding device which introduces the correct proportion of alkali, in the form of caustic soda, into the basket of a centrifugal drier. Upon discharge from the drier, the sulphate is carried by an elevator to a high point in the building, where it is mechanically screened, and any lumps in the mass reduced to uniformly granular condition. The sulphate of ammonia crystals fall from this elevation to the stores, and are further dried by exposure to the atmo-

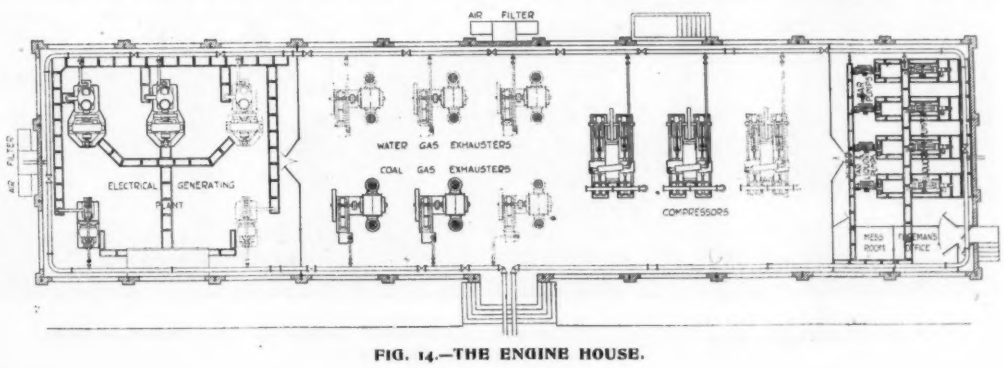


FIG. 14.—THE ENGINE HOUSE.

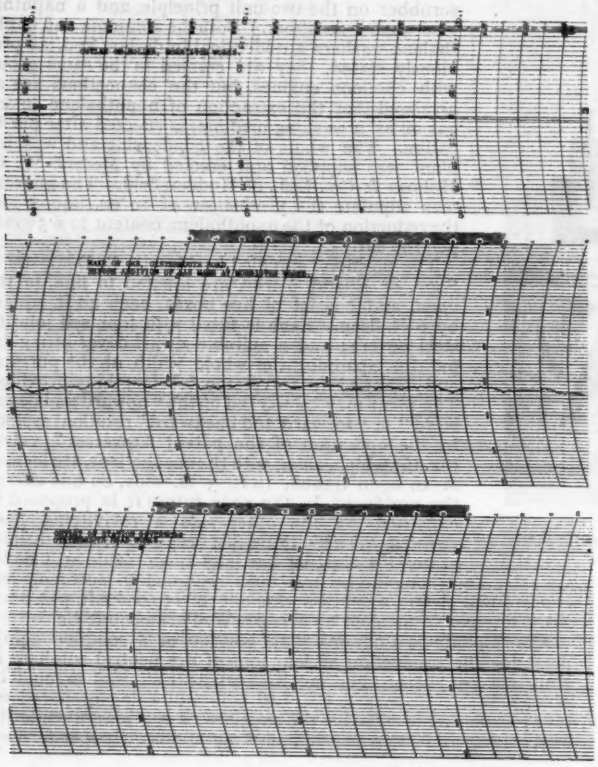


Fig. 17.—Illustrating Quality of the Mixed Gas.

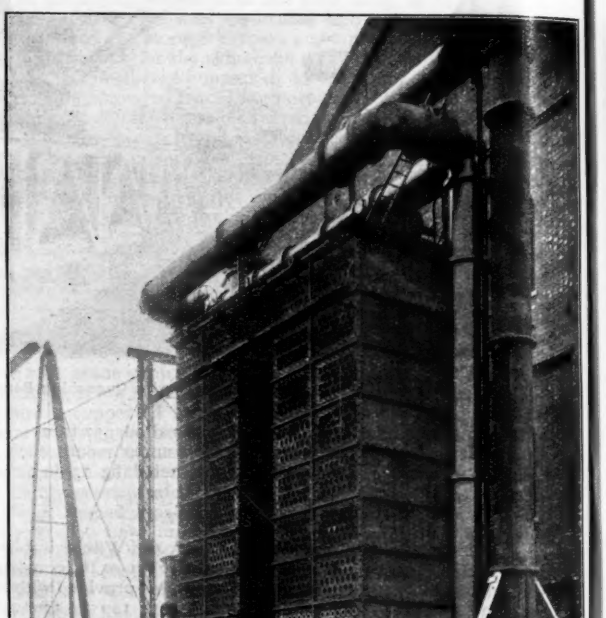
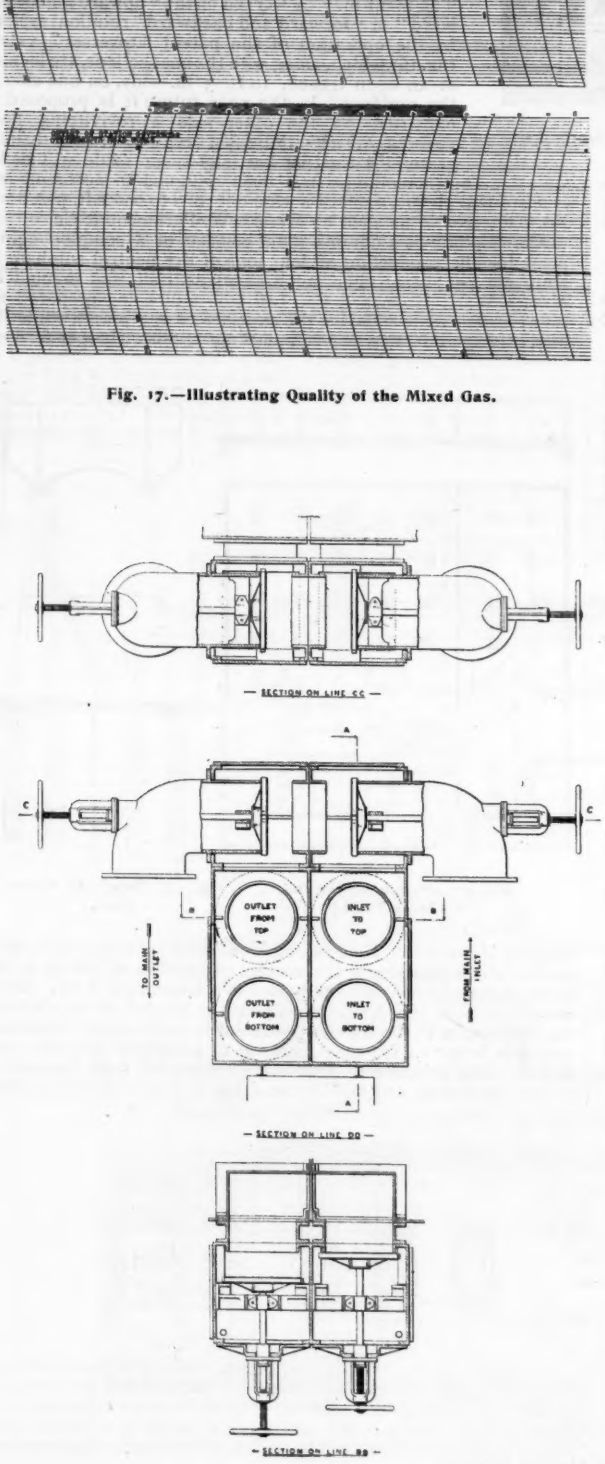


Fig. 15.—Condensers in Course of Construction.


— SECTION ON LINE CC —
OUTLET FROM TOP
INLET TO TOP
OUTLET FROM BOTTOM
INLET TO BOTTOM
TO MAIN OUTLET
FROM MAIN INLET
— SECTION ON LINE DD —
— SECTION ON LINE BB —

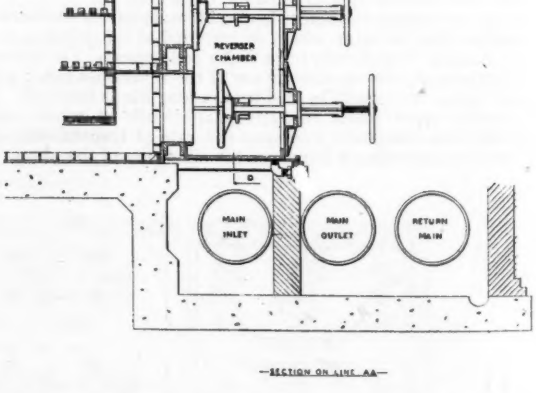
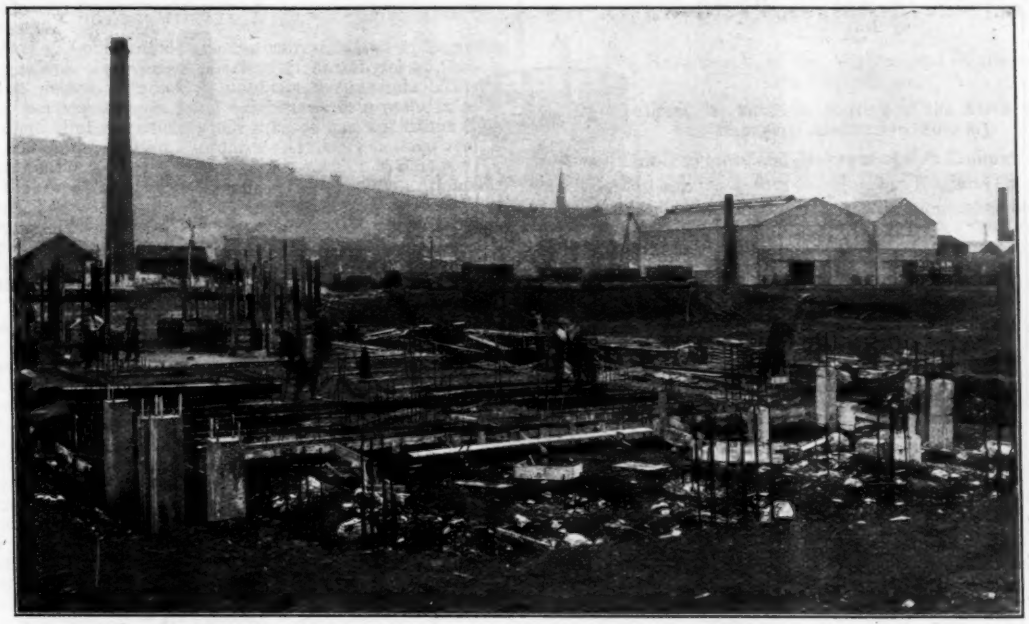


FIG. 16.—SECTIONS OF "ELLAND" CONTROLLER AND REVERSER VALVES.



FERRO-CONCRETE PILES AND SLAB FOR ENGINE-HOUSE FOUNDATIONS.

sphere in falling. Not only is complete neutralization effected, but a dry salt is produced ready for "bagging." The only power required is that necessary to operate the centrifugal drier and the elevator. The apparatus is very simple, and the initial cost low.

It is proposed to erect a tar dehydrating plant of a capacity of 12 tons per diem, and to duplicate this new plant by transferring a set of a similar size from the Oystermouth Road Works. The 2 million c.ft. spiral-guided gasholder with steel tank was erected by Messrs. C. & W. Walker, Ltd. As the inlet and outlet connections are on opposite sides, the quality of the gas on the outlet is very consistent (fig. 17). The governor house and foundations have been designed for the reception of four station governors. One 24 in. governor of Messrs. Willey & Co.'s patent "Simpson" type, and a Parkinson patent disc type safety governor, have been installed. A "Columbus" coke separator has been fixed central to the boiler plant and retort-house, and within the radius of the coke crane, for the extraction of usable coke from boiler and furnace ashes. Modern laboratories, workshops, stores, and offices of uniform design, and suitable residences for the works superintendent and leading mechanics, have also been erected.

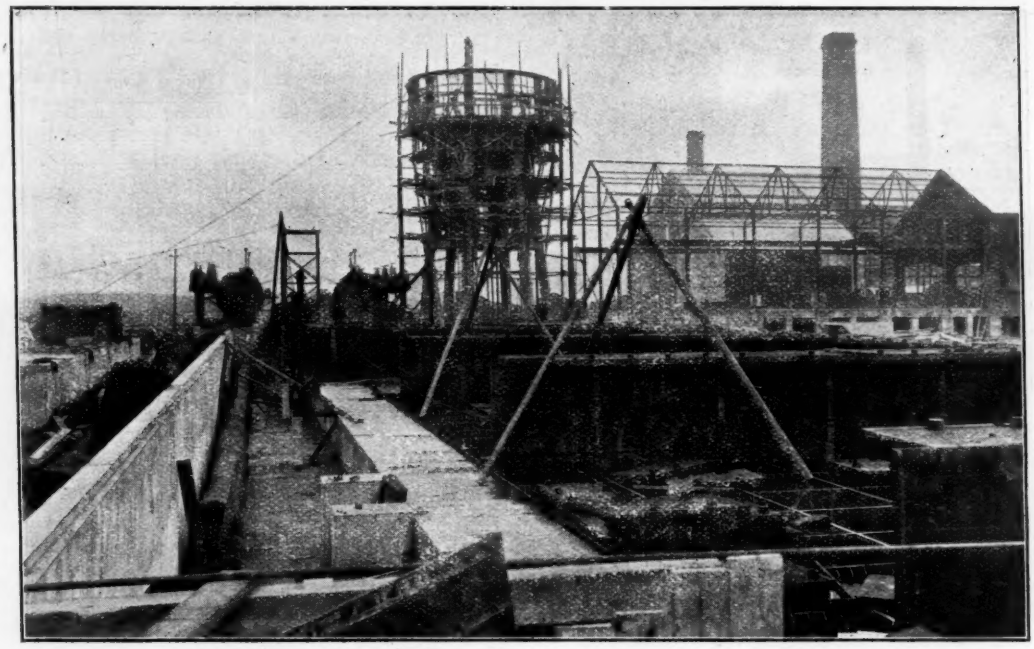
As far as possible, I have endeavoured to avoid repeating in my address any information embodied in the brochure which has been prepared for circulation upon the occasion of the inaugural opening of the Morriston Works; and as the works were only brought into commission during September, I am unfortunately unable to supplement the address with any data of working results. However, the whole of the plant has been started-up successfully, and I am confident that horizontal retorts will prove a wise choice and the most suitable carbonizing unit to meet our local conditions.

THE GAS INDUSTRY IN GENERAL AND AT SWANSEA.

It is gratifying to find the public realizing more and more that gas as a domestic and industrial fuel is not only scientific but hygienic. It is the sure means of coal conservation and of abating the smoke nuisance, which has such a disastrous effect upon public health in our cities and towns. In the past, the condemnation of gas as an air-polluting agent has been persistently and unduly overstated, and its effect upon ventilation equally improperly underrated. Medical authorities, however, are unanimous in recommending gas for lighting and heating.

Mr. Shears, M.D., Sanitary Expert, Health Department, New York, says "the perfect combustion of illuminating gas has a highly beneficial effect on the quality of the air." After drawing distinction between the products of combustion and those of respiration, he continues: "Gas lighting serves a double purpose, it causes induction of fresh air and expulsion of vitiated air caused through respiration." Dr. Toogood states that "from his own experiments he has proved conclusively that with normal ventilation

BOILER-HOUSE AND CHIMNEY, FERRO-CONCRETE CRANE GANTRY, AND RETORT-HOUSE IN COURSE OF CONSTRUCTION.



GENERAL VIEW, SHOWING FERRO-CONCRETE TAR AND LIQUOR TANK ON LEFT, WITH TAR SEPARATOR, WASHING AND SCRUBBING PLANT, FERRO-CONCRETE WATER TOWER, PURIFIERS, ENGINE-HOUSE, BOILER-HOUSE, AND RETORT-HOUSE IN COURSE OF CONSTRUCTION.

gas consumed in modern incandescent burners can be no detriment to health, being found in fact to assist ventilation by the increased circulation of the air. . . If gas lighting is intelligently used in a room intelligently constructed, there should be no vitiation of the atmosphere arising from its use, and the slight increase of temperature is a distinct advantage, as it causes an upward movement of air, which aids ventilation, instead of allowing stagnation of atmosphere." Dr. C. A. Oliver, Ophthalmic Surgeon, Wills' Eye Hospital and Philadelphia Hospital, U.S.A., and other authorities, give unequivocal opinions favouring the use of gas from the point of view of eyesight preservation.

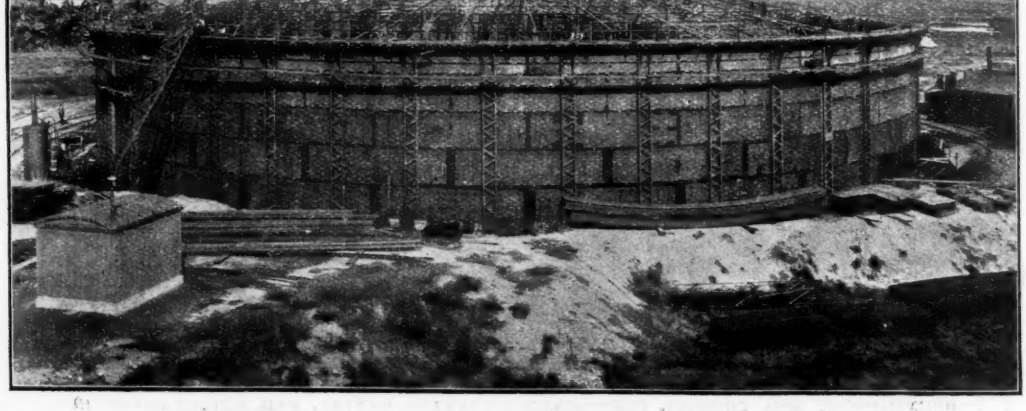
Mr. W. M. Mason, the Manager of that indefatigable body the British Commercial Gas Association, sets out a valuable compilation of medical opinion in an able paper which he read at the annual meeting of the Association recently held in Liverpool. Mr. Mason states:

From the health point of view there is the question of the effect of gas lighting upon the condition of the atmosphere—that is to say, upon the purity of the air in an occupied and an unoccupied room—upon ventilation or movement of air, and upon temperature. Dr. Leonard Hill, in his presidential address to the Physiological Section of the British Association, defines the conditions essential to any good system of ventilation as being "(1) movement, coolness, and a proper degree of relative moisture in the air; (2) reduction of the mass influence of pathogenic bacteria." Stagnant atmosphere is perhaps the worst enemy of health. The late Prof. Vivian Lewes said: "It is upon its very power of setting air in motion, and promoting diffusion, that gas bases a good deal of its hygienic superiority as an illuminant; while the sterilizing effect of the flame and the traces of sulphurous acid in the products give the reduction in organic matters and bacteria that forms the second desideratum of Dr. Leonard Hill's perfect system of ventilation." The highest consumption of gas per acre in any residential district in the world is in the Harley Street area of London, the headquarters of leading physicians and surgeons.

These and many other conclusive opinions prove that gas does not vitiate the air, does not impair eyesight, and ensures healthy ventilation.

Despite the progress of electrical undertakings, the gas industry is more than holding its own; and it is interesting to record that Mr. D. Milne Watson, the Governor of the Gas Light and Coke Company, stated in February last, at the meeting of the shareholders of the Company, that his Company alone produces approximately in a year as much energy (light, heat, and power) as is produced in the form of electricity by the whole of the electrical undertakings in Great Britain.

At Swansea, the make of gas for the nine months ended Sept. 30, 1924, shows an increase of 9 p.ct. over the corresponding period of the previous year—equivalent to an increase of 75 million c.ft. per annum. This is very encouraging. But it is not sufficient in these days to make gas of good quality and distribute it at consistent pressure; we must also pursue a determined policy further to augment our business, for increased sales tend to re-



GASHOLDER AND TANK IN COURSE OF CONSTRUCTION.

duce working costs, to the benefit of the gas-consuming public whom we serve.

Up-to-date gas showrooms are centrally situated in Swansea displaying a wide and varied selection of useful gas appliances of pleasing design. Judicious publicity propaganda is highly profitable, participation in local exhibitions is proving a most effective method of advertising, and sales of gas apparatus have attained an unprecedented standard. At the first Ideal Homes Exhibition held in Swansea recently, we were able to demonstrate to many thousands of visitors a comprehensive exhibit of modern appliances; and while many orders were taken during the exhibition, these have been eclipsed by the number subsequently received—so much so that we have been obliged to augment our staff of fitters in order to satisfy the additional requirements. This augurs well for the future; and with the advent of the Morriston Works we shall be even more aggressive in our commercial activities, and there is no doubt that the erection of new works will be justified. My Directors themselves have every confidence in the future for gas, and they are very optimistic as to the continued prosperity of the Company as a successful public utility undertaking. We invite the ratepayers' and kindred associations, local technical institutions, and also consumers of gas to visit the Morriston Works by appointment, in order that they may inspect the plant and become enlightened upon the care that is exercised to manufacture gas as cheaply as possible, having due regard to local conditions and to the capital involved in the new works.

In conclusion, I should like to express my appreciation of the work of my various assistants, whose combined efforts and enthusiasm throughout have had so much to do with bringing the Morriston Works to a successful issue. I trust the inspection this afternoon will be of interest to you.

Hood-Odell Retort Used for Lignite.

The Lignite Utilization Board, appointed in Canada in 1918 for the purpose of developing a process for carbonizing and briquetting Saskatchewan lignites, have, on account of successful results previously obtained with it, adopted and erected at Bienfait an installation of Hood-Odell retorts, as designed and operated by the United States Bureau of Mines in conjunction with the University of North Dakota. Referring to the matter, Mr. B. F. Haanel says this retort depends on internal combustion to supply the heat for carbonizing. The carbonizing chamber is a vertical shaft with tapered walls open at the top; and baffles are inserted in the centre for the purpose of imparting a mixing action to the coal in its passage through the retort. Beneath the carbonizing chamber is the cooler, consisting of a metal chamber supplied with baffles, in which the hot lignite char is cooled by radiation. Provision is also made for blowing steam or water on to the carbonized lignite, to assist the action of the cooler, from which the residue is discharged by means of a paddle-wheel rotating at a constant speed. Carbonization is effected by burning the distilled gases, and a portion of the fixed carbon of the fuel and air for combustion is blown in through cast-iron air boxes. These boxes are provided with slots which ensure an even distribution of the air through the length of the retort. Combustion takes place at two zones, which are known as the upper and lower hot zone, and side baffles suspended on the air boxes create a surface of lignite fuel on which air is blown, resulting in combustion and distillation. A fresh surface is continually presented by the slowly moving mass of lignite. The excess gas is drawn away through an off-take in the coal mass immediately above the upper hot zone, which consists of a pipe of suitable dimensions provided with slots. A metal curtain which partially surrounds this pipe provides clearance space for gas removal. Sufficient suction is employed to draw the gas into this opening, and by a proper adjustment of air pressure at the off-take all the vapours are removed, and no gases escape from the top.

Ventilation of Geysers.—The Torquay Corporation have authorized the Medical Officer to ascertain that all geysers fitted in houses for which sanitary certificates are desired are properly ventilated, and that such ventilation be made a condition before sanitary certificates are granted.

Coke-Oven Gas for Town Supply.—Writing in the November issue of "Fuel in Science and Practice," Mr. R. Wiggerton gives, from a recent Board of Trade return, some interesting figures relating to the use of coke-oven gas for town supply. No less than 4268 million c.ft. were used for this purpose in 1923; this being 1¾ p.ct. of the total consumption. The figure for 1922 was 3636 million c.ft. Of the sixteen undertakings using coke-oven gas, five relied on it exclusively—viz., Rhymney (268 million c.ft.), Pontypridd (137 millions), Stocksbridge (38 millions), Dunington (36 millions), and Little Hulton (21 millions). In four other places—Middlesbrough (834 millions), Ossett (164 millions), Wath (117 millions), and Swinton (71 millions)—very little coal gas or water gas was used. The largest single consumer of coke-oven gas was Sheffield, using 1903 million c.ft., or 44·5 p.ct. of its total requirements. Coke-oven gas was also used at Rotherham (240 millions), Leeds (228 millions), Port Talbot (79 millions), Chesterfield (50 millions), Kidsgrove (46 millions), and Eckington (17 millions). These figures should be an encouragement to all who are interested in the extension of this promising outlet for surplus coke-oven gas.

A FEW DISTRIBUTION EXPERIENCES.

By J. B. HENDERSON, of the Walker and Wallsend Union Gas Company.

[A Paper read at the Auxiliary Meeting of the North of England Gas Managers' Association, Nov. 8.]

In 1902 the Engineer and Manager of this Company, Mr. A. B. Walker, read a paper before the North of England Gas Managers' Association showing the distribution developments necessary to meet the increasing consumption at that time. The gas made in 1902 was about 225 million c.ft., and in 1920 it had reached 431 millions—an increase of 91·6 p.ct.

In 1908 the Walker and Willington Quay Works were shut down so far as manufacture was concerned, and the whole of the gas was made and sent out from the works at Howdon Lane. As the new works are situated at practically the eastern extremity of the district, it was necessary to lay about 1¼ miles of 24-in. main from the governor to Wallsend, and feed into the three 12-in mains supplying Wallsend, Walker, and Walker Gate. The Willington Quay portion of the district is supplied from a 15-in. governor by a 15-in. main connecting into the old distribution box at Willington Quay in such a way that the old governors can still be put into action if necessary.

At the end of the 24-in. main in Wallsend, an 18-in. branch and valve is fixed with a view to feeding the mains which had been previously laid in a northerly direction, where developments were expected and are now materializing. It was also intended that this main would be reduced to 15 in. and extended to Walker Gate, thereby forming a circuit with the existing trunk mains, which follow the riverside tram route and Scrogg Road. As far as possible, all the mains in the district are laid out on the arterial or circuited system, the advantages of which are increased capacity, equalization of pressure, and no cessation of supply during the time occupied in making new connections and repairs. The latter is very important, as gas has now become a necessity at all hours of the day. A feature of this system is that a main may be partially or wholly choked without one being aware of it. We had a case like this recently, where a 4-in. syphon, which filled with water from a damaged service, caused complaints of short supply from about fifty consumers. The syphon was pumped and the supply restored until the following morning, when the main was bared at the opposite feeder and, after reflooding the syphon, the stoppage was found and cleared. If the supply had not been accidentally cut off by the water, we should not have known that the main was affected, but the evil would have been greater if the main had not been circuited, as no gas could then have been obtained.

The change in the formation of road surfaces during comparatively recent years has called for an alteration in the position of mains for new streets and streets which require re-surfacing. Twenty years ago it was considered satisfactory, when a street was being made with rubble bottom and chip paving, to run one main near the centre; but now that tar macadam, concrete, and concrete bottom with block paving have become the practice, it is advisable to lay a main in each footpath. Though the initial cost of mains for these streets is practically doubled, the shortened services and reduced maintenance expenditure fully compensate for the extra money spent.

The size of new mains also calls for attention. In the laying-out of new estates in this district, it has been our practice to consider what would be the likely development of the ground beyond any estate under consideration. In consequence of this forethought, the enlarging of mains has been obviated. We have practically discarded the use of 3-in. cast-iron pipe, as in our opinion this size has neither the strength nor the carrying capacity to warrant its continued use. The inadequacy of this size was demonstrated recently when looking into a 3-in. main from which the bend of a ¾-in. service pipe had been removed. The length of the service from the main to the meter was about 35 ft., and it had been blown out from the meter some time previously. The dry rust dislodged with the force pump was deposited in a heap directly beneath the service hole; the top of the heap, which was of conical formation, coming within about ¾ in. of the top of the inside of the main. If the main had been of larger size, the restriction would naturally not have been so pronounced. During the last twenty years, only three miles of 3-in. main have been laid, while our main mileage for this period has increased from 39 to 63 miles, or 61·5 p.ct.

Naphthalene stoppages in mains are very rare in this district, those we have had being confined to old mains supplying outlying areas. The question of rust in mains has not as yet given any trouble; but considering the amount dislodged daily by service pumps, the probability is that we have this evil to meet. Our only other cause of stoppage in mains is the sudden flooding of syphons due either to broken mains or faulty service pipes. Our system is to have the whole of the syphons pumped every four weeks; and those showing an abnormal collection of water are visited again within that period, as the quantity collected warrants. Once every year, usually in summer, an assistant is sent round with the syphon man, with a book containing a sketch of the position of each syphon, to see that every one is visited. The book is marked with the date; and a glance through will reveal any syphon not visited.

Regarding the question of escapes from mains, we find that the

majority of breakages occur where a service is connected to a 3-in. main. During 1923, out of twenty broken 3-in. mains, thirteen were at service holes. The reason for this is, of course, the diminished strength of the pipe at this point. As the majority of these breaks were on old mains, I cannot help thinking that the method employed at that time of cutting holes for services with the hammer and chisel caused more fractures than we were then aware of, and these faults are manifesting themselves gradually.

There are breaks in mains, however, for which the reason is almost impossible to find. In one case recently a 12-in. main in a macadam road, 2 ft. 6 in. from the kerb and with 5 ft. 4 in. cover, was broken transversely and split lengthwise for about 15 in. at the bottom. The alignment was good, and no movement or subsidence of the road was perceptible. Mains and services call for the most strict attention when being laid or renewed, for, whereas meters, cookers, and fittings are accessible at any time, mains and services inspections entail heavy expenditure. The portion of the service from the main to the curtilage is laid by the Company; the remaining portion to the meter being laid, in the case of new services, by the builder's plumber.

By the Company's 1903 Act, we have power to specify the size and material of services, and may also demand 24 hours' notice to inspect the same before they are covered up, and, if not found satisfactory, a supply may be refused until the defect has been remedied. This clause has proved a boon to us, for whereas most master plumbers are amenable to reason, others have to be threatened before they will do as we require. It would be an advantage if this power was obtained and enforced by all gas undertakings, as it is only necessary to give proper supervision in this matter in the first place to ensure a satisfactory supply afterwards. It is the practice of this Company to fit a stopcock in the footpath on each service, for the following reasons. (1) Easy stoppage of gas in case of an escape on consumer's portion of the service, or in case of fire. (2) Easy and absolute stoppage in case of unpaid accounts. (3) A convenient place to turn off in case of using the force pump on a service supplying more than one meter.

Our method regarding service layers' equipment is that each squad has a handcart fitted with pipe vice and all tools required for this work, including main driller, stocks and dies, pipe grips, and a stock of fittings likely to be required. We adopted the main driller in preference to the hammer and chisel about four years ago, and though it was not well received by the men at that time, it has now become the recognized method of piercing all mains from 12 in. diameter downwards. A case of a cracked main while using the hammer and chisel occurred a few months ago, and is perhaps worth mentioning. A service layer was cutting a ¾-in. hole in a 24-in. main, for a lamp service. He is a capable and cautious workman, and his chisels were in good condition, yet before he had pierced the main he heard a crack and found that the main had split in a transverse direction for about a foot on each side of the hole. I am, however, sure that there must have been a strain on the pipe or a fault in the metal to cause this fracture. To prevent the possibility of this happening a second time, a split collar was placed over the fault, the machine fixed, and the hole drilled alongside it.

During my service with this Company, various methods have been employed for the preservation of service pipes. At first the ordinary black iron gas pipe was used. Then this tube was encased in a U trough and filled-up with a mixture of heated tar and pitch. Then steam quality tube was used in a V trough and covered with the same mixture. We never considered that covering a pipe in a trough with tar and pitch was a satisfactory method, because the temperature of the mixture was reduced as soon as it touched the pipe, and consequently it did not adhere. Another drawback to this method was that, if the pipe got wet in the trench, much time was spent trying to dry it, for it is useless to apply tar and pitch to a wet pipe. About three years ago we stopped the use of troughing, and now use a covered and coated pipe. I have here a sample of solid-drawn steel pipe which was covered and coated, and, but for its susceptibility to corrosion, would have made an ideal service pipe. The pipe used by us lately has been of the best Staffordshire puddled iron of steam quality, and is proving satisfactory. It is necessary, however, to see that the service layer is particular in coating and covering the pipes where a socket is used, as the whole length might as well be left bare if this is not properly done. For this purpose we use a bitumastic solution, which is applied cold, covered with Hessian cloth, and again coated. One disadvantage of covered pipe is that a fault may exist under the wrapping without its being known. A case of this kind occurred recently when, after a service was renewed and tested, it seemed sound; but about a week later an escape of gas was reported. It was found, on examination, that near the centre of a length the pipe was badly welded, and the gas, acting upon the solution, had liquefied it and forced its way through. About two years ago the services to 36 houses at Walker called for special consideration, as the filling under the floors, and the subsoil in the street were composed of boiler ashes. After due consideration the whole of the services from the main to the meter were laid with ¾ in. 6-lb. lead pipe in a U trough, covered with tar and pitch, and a ½ in. board nailed on top. Though the cost of these, excluding reinstatement charges, amounted to £50 12s. 8d. or 9s. per yard, in comparison with £33 12s. 6d. or 6s. per yard for covered iron pipe, it was felt that the extra cost was money wisely spent.

At the latter end of 1921 we commenced the renewal of services, choosing those streets which we knew contained services in the most corroded condition. Since then we have renewed about 2000 services. Our experience has been that, in streets with whinstone chip paving on rubble, the services have a shorter life than those under macadam roads, though in both cases the pipe may be embedded in clay. A possible theory for the difference is that in most paved streets a layer of ashes is used to cover the rubble and bind the paving, and the acids from these are washed into the clay and attack the pipe. In the case of macadam streets, we find that the portion of the pipe attacked first is usually that under the channel blocks, where ashes again have been used. The service in a subsoil of ballast appears to have the longest life, probably due to the presence of chalk and limestone, which neutralize any acids present.

I have here a common sample of service pipe taken from a paved street which was laid 25 years ago and renewed recently. You will notice that the corrosive attacks have been all from the outside. I do not mean to infer, however, that we are immune from stoppages due to rust, but in no case has a serious attack of internal corrosion been noticed.

The renewal of that portion of the service pipe which is on private property from the curtilage to the meter is carried out by us free of charge, provided the owner will sign a form to undertake the reinstatement of all structural work, such as cement paths, &c.

Our district being a purely industrial one, mention might be made of the question of large supplies to shipyards and engineering works, as far as meters are concerned. Our aim in connection with these yards has been to have one or two master meters fixed as near the works boundary as possible, and check meters fitted on supplies to the different shops, if required. This is preferable to having a number of services running under the ground where heavy weights are dumped without any consideration for what is underneath. Regarding the question of sizes of industrial meters, these should be of sufficient capacity to supply the maximum quantity of gas required; but should the consumption show a marked falling-off, arrangements should be made to have the meter tested and, if correct and no increased use of gas is anticipated, the meter should be changed for a smaller one. A case where this procedure was found very profitable was one where a private 300-light meter with 4-in. connections was supplying a boat repairing yard. The meter had been used for power and lighting; but, when electricity was substituted, it was retained and used only for two small bunsen burners. Along with the other industrial meters in this district, it was tested and found to register correctly according to the Sales of Gas Act, but no consumption was shown on the inspector's survey book. We advised the manager of the yard that a much smaller meter should be fixed, and would take up less room. He gave us permission to change it, and a 10-light meter was fixed. The consumption registered since then has been on an average about 6000 c.ft. a month. It is advisable that all large meters should be tested *in situ* about every five years; and during these times of depression in shipbuilding yards and engineering shops, we should not allow, without verification, the excuse that lack of work is answerable for all decreased consumptions.

Another important matter affecting industrial areas principally is the use of compressed air with gas. The following experience is worth mentioning. The mains at the western end of the district have been three times affected with air during the last three years. The first and second times were slight, but the third case, which occurred in July, 1923, was so serious that it took us four hours with three 1-in. syphon pipes blowing before the gas would ignite at the cooker burners. During the time the air was being blown out, all the places in the vicinity where compressed air and gas were used were visited, but no solution was forthcoming. Suspicions were entertained of a large engineering works supplied from an 8-in. main, and it was found out a few months afterwards that these were correct, the cause being the accidental or wilful connecting of the gas and air supplies of a blowpipe. The air pressure in these works is 60 lbs. per sq. in. I think it would have been wise if the Board of Trade had compelled the insertion of a non-return valve on the outlet of all meters where gas is used with compressed air.

While speaking of gas in shipbuilding yards and engineering works, reference might be made to the use of gas for bending wrought-iron pipes. There are three works in our area where gas is exclusively used for this purpose, and the method employed is different in each case. In one works, after placing the pins in the bending block, to suit the template, the pipe is placed on the block, and if, for example, the pipe is of 4-in. diameter, then a piece of 6-in. pipe about 2 ft. 6 in. long is slipped over it. The 6-in. pipe has a hole in it about the centre, in front of which is placed the nozzle of the blowpipe. The flame swirls round in the annular space and the spent gases escape at the ends. The air pressure is about 10 in. water column.

The second works use two firebrick blocks encased in sheet iron, instead of the 6-in. pipe in the former case. The objections to these blocks are that they are more expensive, less easily handled, and liable to be broken if dropped on the floor after use. There is one advantage in the firebrick block—that the heat is more conserved. The air pressure here is about 2 lbs. per sq.in.

The third works, which have the largest installation of the three, have been using gas for this purpose for about four years, and the consumption for the twelve months ended Aug. 31 was

just over 7 million c.ft. In this plumber's shop, the pipe is first heated in a furnace, and then taken to the bending block. The furnace is a modification of the ordinary plumber's coke fire; the brickwork being carried about 1 ft higher, with a U trough about 9 in. wide left through the centre. The flame in this case comes in at the bottom, and a firebrick slab is placed over the trough after the pipe is put in. Should the pipe be above 6 in. diameter, another type of furnace is used which has a flat top, on which the pipe is laid, and firebricks are built loosely round it. For the larger sizes of pipe, two blowpipes are used horizontally, but not directly opposite each other. The air pressure at these works is about 1 lb. per sq.in.

It is interesting to note that the official in charge of each of these installations thinks his own method the best. When visiting the third works a few months ago, it was noticed that, instead of the cutters or hack saw, oxygen and coal gas was being used for cutting pipes, and also for lead burning. The industrial use of gas should be fostered by all gas undertakings as much as possible, for whereas the capital expenditure to obtain this consumption was negligible in this case, it would have entailed the laying of a considerable length of main, together with meters and cookers, if taken on a housing-scheme basis of lay-out. There can be no doubt that gas is much more economical than the old type of coke fire. There is a different atmosphere in the shop, and there is no smoke, and no ashes have to be removed. It is also a fact that the output of work per man is much increased. In one case where a night shift was at work with coke fires, the change-over to gas resulted in the elimination of the night shift, and at the same time an increased output from the shop.

In conclusion I will take this opportunity of thanking our Engineer and Manager, Mr. Walker, for his kind permission to bring these topics before you.

Discussion.

Mr. W. E. OULDS (Tynemouth) opened the discussion. He said the discarding of 3-in. cast-iron pipes was, to his mind, to be recommended, as the better results of the increase to a 4-in. pipe justified the expenditure. The periodical attention to large meters in industrial works was certainly worthy of emphasis.

The CHAIRMAN said that in Newcastle they had been experimenting with a suction cleanser for clearing the rust from services, but it was rather cumbersome and took two men to handle it. Up to the present it had not been entirely successful. All the syphons were entered on a separate card, giving the position and the date on which each was fixed. If the syphon were to be found above normal, it was reported to the mains superintendent, who took the matter in hand. Mr. Henderson had referred to the testing of meters. About twelve months ago the National Gas Council took the matter up; and the speaker thought it was suggested that the tests should be every seven years. They made spot tests in Newcastle, and had in one instance found that an escape had been going on and had not been registered.

Mr. HENDERSON briefly replied to the discussion.

Mr. C. F. BARROW (Sunderland) in moving a vote of thanks to Mr. Anderson and Mr. Henderson, said it was very encouraging to see young men coming forward to read papers. It gave them the feeling of certain security in the industry.

Mr. G. C. BARRETT (West Hartlepool) seconded the vote.

Mr. A. B. WALKER, Engineer and General Manager of the Walker and Wallsend Union Gas Company, on behalf of the Chairman and Directors of the Company, extended to the members of the Auxiliary Section a hearty welcome to the Howdon Works, and said that they would be prepared to show them anything they would like to see. He took the expressions of appreciation of the papers read that afternoon as in some respect a compliment to himself. Mr. Henderson started at the works when a boy, and Mr. Anderson had been with him some time, having come straight from college. Mr. Anderson, as a college-trained man, was able to sit down and tackle the practical business as well as the theoretical. The speaker believed that Mr. Anderson had a few more papers up his sleeve.

On the proposal of Dr. WEYMAN, it was agreed to hold the next meeting at Armstrong College, Newcastle, where it might be possible, he said, to arrange for the inspection of the Chemical and Engineering Laboratories and the Agricultural Department. He believed they could spend a very interesting afternoon at the College.

Those present were afterwards shown over the works. Tea was served at the invitation of the Walker and Wallsend Union Gas Company, to whom a very hearty vote of thanks was accorded.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Works of the Tottenham Gas Company.

On Saturday last, the Association paid a visit to the Willoughby Lane Works of the Tottenham District Light, Heat, and Power Company. In all respects the visit was thoroughly enjoyable. The weather could not have been better; and this, coupled with the courtesy and efficiency of the guides, made the occasion one which will be long remembered. The outstanding impression of the tour through the works was the orderly cleanliness of everything—from the retort houses to a remarkably efficient and well-organized dressing station. The latter is an object of pride to the Ambulance Brigade drawn from the gas-workers, who take the keenest practical interest in their work, and is certainly the subject of admiration to all who visit it. The new laboratories, too, are excellent, and constitute an example of a high standard. They comprise a general laboratory and a calorimeter room; and it was interesting to note that the latter is maintained at a constant temperature night and day—an essential which unfortunately does not invariably receive the consideration it deserves. The whole lay-out of the works reflects the greatest credit on Mr. A. E. Broadberry, the late Engineer; and their state of upkeep indicates that the present Engineer, Mr. H. C. Smith, appraises at its true value the effect of surroundings on the workers.

CARBONIZING PLANT.

No. 1 retort house contains eighteen beds of 22 in. by 16 in. by 20 ft. retorts set in beds of eights. The whole of the retorts in this house have been re-set during the present year. The beds are arranged in two benches. One bench has been set with silica retorts, and the other with moulded Stourbridge. The retorts are operated by a Fiddes-Aldridge machine; the coke being removed by a De Brouwer hot-coke conveyor. The nominal capacity of this house is 2 million c.ft. per diem. It is intended to erect waste-heat boilers in this house at an early date.

No. 2 retort house contains 24 settings of 22 in. by 16 in. by 20 ft. retorts set in beds of tens. These retorts are charged and discharged by De Brouwer projectors and pushers. The coke is again removed by means of a De Brouwer hot-coke conveyor. The nominal capacity of this house is 4 million c.ft. per diem.

In both Nos. 1 and 2 retort houses the hot-coke conveyor also acts as an elevator, and discharges coke on to the screens. The screening plant at No. 1 retort house is worthy of notice. It was put to work at the end of July, 1923, and at that time was believed to be the only example of its kind working in this country. It is very well balanced; the vibration caused by it being practically *nil*. The screen has given every satisfaction.

No. 3 retort house contains 56 Woodall-Duckham vertical retorts, having a nominal throughput of 6½ tons per diem. These retorts are heated by means of gas generated in "Tees" producers with mechanical grates. A portion of the waste heat from the vertical settings is recovered and used for the generation of steam in waste-heat boilers. Coal and coke are handled in this house mainly by gravity-bucket conveyors. No. 3 retort house has a nominal capacity of 4½ million c.ft. per diem.

WATER GAS PLANT.

This was first put into operation in 1894. At that time Beckton was the only works in England using the system. The plant now consists of three sets each having a nominal capacity of 1½ million c.ft. and two sets of 1 million c.ft. per diem. A waste-heat boiler is fitted to one of the larger sets.

PURIFYING PLANT, &c.

The condensing and scrubbing plant is on more or less orthodox lines. With regard to the condensing plant, it has been found advantageous not to depend on water condensers alone, but on a combination of air-cooled and water-cooled condensers. The gas from the two horizontal retort houses mixes at the inlet to the condensers. The ammonia washing plant for this gas consists of Livesey washers and rotary scrubbers. All purifiers are of the dry-lute type; the water gas boxes and the horizontal-section coal gas boxes being constructed of cast iron, while the vertical-section boxes are built of reinforced concrete. The method of filling the horizontal-section boxes is of interest. The apparatus used consists of a combined elevator and shuttle-belt conveyor, by means of which oxide can be raised from ground-level and delivered to any point in the boxes. The vertical-section exhausting plant consists of two 4½ million per diem "B. T. H." turbo exhausters, steam turbine driven. The gas is treated in Livesey washers and vertical centrifugal scrubbers.

ELECTRIC GENERATING PLANT.

All the electricity required on the works is generated in the engine room adjoining the exhauster house of No. 3 Section, by means of "E. C. C." generators and Bellis & Morcom engines. These sets are in duplicate, and generate up to 150 KW. each.

NEW WORKS.

The present works site in Willoughby Lane is now fairly congested, and the erection of new plant has commenced on the site east of the London and North-Eastern Railway. A new gasholder has been erected of 7 million c.ft. capacity, also a new sulphate plant, and tar dehydration plant with the necessary boiler plant. A lay-by has been constructed alongside the River Lee. This has been used for unloading oil barges and for loading tar. In the future it is possible that coal will also be brought up by barge and unloaded here.

RECREATION GROUND.

Adjoining the south end of the works is a recreation ground of about six acres. This ground is used for cricket, football, tennis, and other sports. It also contains the Company's War Memorial, which takes the form of club premises and a cricket and football pavilion for the use of the Company's employees generally.

It was here that the members, numbering about a hundred, gathered for tea after inspecting the works.

Mr. W. NEWTON BOOTH, President of the Association, remarked that one usually associated a gas-works with dust and grime; but

this criticism could in no way be urged against the Tottenham undertaking, which was a model of cleanliness. This, without doubt, was because the Engineer took an interest in the beautiful side of gas engineering; and on the results of this, and on the efficient lay-out of the works, he congratulated Mr. H. C. Smith. The Tottenham Company, in addition to providing light and heat in the form of gas, also supplied electrical power. He trusted that this was not regarded as a possible loophole of escape, but rather as a bye-product of a major industry—an industry which made the most efficient use of fuel. The Company were fortunate in having plenty of spare ground on the eastern side of the works, which would stand them in good stead in the event of future extensions. The Association owed their warmest thanks to the Directors, Engineer, and staff of the Tottenham Gas Company for their kindness and hospitality.

Mr. W. L. WESTBROOK, North Middlesex, moved a formal vote of thanks. All would agree, he said, that the afternoon had been one of enjoyment and interest. The works of the Company—one of the most important in the Metropolis—had been planned with skill and foresight; and the orderliness of the whole was evidence of keen supervision, and excellent co-operation on the part of the workers. He was glad to see that gas lighting still held its own in a gas-works. The lighting of the undertaking was up-to-date and highly efficient.

Mr. W. A. BARNETT, South Metropolitan Gas Company, seconded the vote, which was afterwards carried with enthusiasm. He remembered the time when there was only one retort house at Tottenham. Since then he had watched with great interest the growth of the works, and had seen the gradual development of plant and processes, which had culminated in the installation of Woodall-Duckham verticals. No more interesting works could have been chosen for a visit of the Association.

Mr. H. C. SMITH, replying, expressed the pleasure of the Directors of the Company and himself in welcoming the Association to Tottenham. He was a great believer in these Association visits, from which more good resulted than was the case with individual inspections. They enabled a man to meet his friends in the profession, and to discuss with them matters of common interest. By visiting various undertakings they would discover what to do, and—equally, if not more, important—what not to do. Until the outbreak of the war the Tottenham Company doubled in size every ten years. As for the lay-out of the plant, this was due to Mr. Broadberry, his predecessor, who was certainly to be congratulated. He (the speaker) was responsible only for the planning of the new plant on the eastern side of the works. An item of considerable interest was a new scheme for dealing with effluent liquor, which had been formulated and put into practice in conjunction with Mr. T. Lewis Bailey, Chief Inspector under the Alkali, &c., Works Regulation Act. The effluent liquor was passed through a tower filled with propeller packings; and the waste gases from the boiler plant were forced upwards through the stream of liquor. This had resulted in a reduction of 7 p.ct. in the phenol content. Mr. Booth had mentioned the general appearance of the works. After all, it was only right that as much as possible should be done to make agreeable the conditions under which the men worked. The success of an undertaking depended not only on the technical skill and experience of the management, but also, and in equal measure, on the hearty co-operation of contented employees. He would say that Mr. P. C. Gardiner, the Chief Chemist of the Company, had been responsible for the mapping-out of the routes taken by the Association in their tour of the works.

Mr. GARDINER acknowledged the vote of thanks, on behalf of those who had helped to make the visit a success. All concerned had been only too pleased to be of service to the Association; and it was gratifying to reflect that nearly a hundred members had taken part in the inspection.

Following this, the Association visited the Company's showrooms in the Tottenham High Road. These premises—like the works—demonstrate what can be done in the way of gas service. The exterior lighting of the showrooms, for which Mr. S. B. Chandler is responsible, is by means of Keith 600 c.p. high-pressure lamps, and is a splendid advertisement for the use of gas as an outside illuminant. The showrooms themselves are admirably arranged, and the different appliances are displayed in a most tasteful and convincing manner. It is interesting to note that the compressor plant for the high-pressure lighting is in an annexe of the showroom, and is used with benefit for demonstration purposes. The Company have latterly enjoyed great success as a result of their sales efforts; and there is every reason to expect that the demand for gas will not only be maintained, but will steadily increase.

Junior Institution of Engineers.—At an extraordinary general meeting the Junior Institution of Engineers have decided to reduce the subscription for junior members. At present an associate member, who may be between the ages of 19 and 26, has to pay an annual subscription of 37s. (or 30s. in the provinces); and the resolution agreed to was that the subscription for those under the age of 22 should be reduced to 30s. (or 25s. in the provinces), the subscription for those above this age being the same as at present. It is hoped that this reduction will encourage more young engineers to join the Institution at the outset of their training period.

INSTITUTION OF CHEMICAL ENGINEERS.

An Ordinary General Meeting was held at University College, London, on Wednesday, Nov. 5—Sir FREDERIC NATHAN presiding. In opening the meeting, the Chairman said the members would be pleased to hear that the Hon. Secretary, Prof. J. W. Hinchley, who had just undergone an operation, was making very satisfactory progress.

The following paper was read:

A CRITICAL STUDY OF THE PUBLISHED RESULTS OF TESTS OF WATER GAS PLANT.

By Dr. M. W. TRAVERS, F.R.S.

In working out a process for the complete gasification of coal, an account of which was recently published in the "JOURNAL" by Mr. F. W. Clark and myself*, we made use of the published results of experimental researches on the water gas process carried out by H.M. Fuel Research Board,† and by the Research Committee of the Institution of Gas Engineers.‡ The results of these investigations were not at the time considered in any way critically. Since this paper was published, it has been considered advisable to examine the published data relating to water gas manufacture critically, particularly with a view to determining the influence of various factors on the efficiency of gas production. The study was carried out entirely for our own information, and with a view to improving our process for the complete gasification of coal, and not with a view to publication. Least of all was it intended to criticise those workers to whom we owe such quantitative knowledge of the water gas process as now exists. However, it would be doing no service either to them or to the gas industry to admit that experimental research has done more than lay a foundation on which knowledge of the water gas process can be built up. A great deal of work, both in the laboratory and on the plant, remains to be carried out; and in the meantime studies such as the following may be of assistance to those who are planning further experiments.

2. In the two reports referred to above, chemical and thermal balance-sheets are used to show how the energy and material involved are utilized. Thus we have:

Credits.	*Debits.*
Sensible heat of coke.	Sensible heat of water gas.
Latent heat of coke.	Latent heat of water gas.
Sensible heat of steam.	Sensible heat of blow gas.
Sensible heat of air.	Latent heat of blow gas.
	Sensible heat of waste, ashes, &c.
	Latent heat of waste, ashes, &c.

Something more than this is really required, particularly as such balance-sheets have always been based upon the assumption that the carbon unaccounted-for as water gas and as waste in the ashes, &c., left the plant in the blow gas. What is really wanted is a statement showing the relationship between the three sub-processes into which the water gas process may be analyzed, and which are usually referred to as:

(*a*) The blow process.
(*b*) The run process.
(*c*) The clinkering process.

We will not include the "blow-run," an American device which would raise the carbon-dioxide content to an extent inadmissible in English practice.

3. These three sub-processes can be considered as being conducted independently, and a statement can be prepared showing the debits and credits under each head of account, as below:

—	I. Blow.	II. Run.	III. Clinkering.
Heat of reaction	(+)A	(−)A′	(+)A″
Sensible heat of gas	(−)B	(−)B′	(−)B″
Sensible heat of air	(+)C	..	(+)C″
Sensible heat of steam	..	(+)D′	..
Sensible heat of coke	(+)E	(+)E′	(+)E″
Sensible heat of ashes	(−)F	(−)F′	(−)F″
Radiation and conduction	(−)G	(−)G′	(−)G″

The capital letters refer to quantities of heat in any convenient units. The indices ′ ″ show whether the quantity refers to the blow, run, or clinkering process. The signs (+) or (−) in brackets indicate whether the numerical values are positive or negative. If the relationship between the quantities is such that they represent the balance in the water gas process, then

$$(A + A' + A'' + B + B' + B'' + C + \&c. \ . \ . \ .) = 0.$$

4. The statement that the three sub-processes may be regarded as taking place independently, may require a little explanation. In the blow process air is blown into the coke, and a quantity of heat represented by the algebraic sum of the quantities in column I. is rendered available, as sensible heat in the plant and its contents, for the conduct of the second operation. In practice we find that there is a limit to the period of the blow, and this is

* "JOURNAL," for Oct. 3 and 10, 1923.
† Fuel Research Board Technical Paper No. 7.
‡ Reports VI. and X. ["JOURNAL" for Oct. 19, 1921, and July 4, 1923.]

actually when the numerical value of negative quantities approaches the numerical value of the positive quantities. However, we are not at the moment in any way concerned with the mechanism of the process, or how the energy is stored up during the blow process. All we have to consider is that when a certain quantity of coke is gasified in the blow process, a certain amount of heat is rendered available for the run process; and this quantity, which we will later denote by the symbol P, is the algebraic sum of:

A, which increases with the value of the ratio CO_2 : CO in the blow gas, since the heat of formation of CO_2 is greater than the heat of formation of CO;

B, which for any quantity of carbon gasified as blow gas increases both with the carbon dioxide content of the blow gas and with the temperature at which the gas leaves the fuel bed;

C, which increases with the temperature of the air, and with the quantity consumed, but is an unimportant factor;

E, which depends upon the temperature of the coke;

F, which depends upon the temperature of the ashes removed from the plant, and the quantity of waste, a share of which is allocated to each part of the process;

G, which depends upon the insulation of the plant, and the duration of the blow, relative to the duration of the run period.

5. Similarly the energy utilized during the blow, which we will denote by the symbol Q, is the algebraic sum of the quantities under column II. However, it is not necessary to go into details at this stage, except to point out that we shall simplify the problem by assuming that we are considering what may be called standard practice, in which a water gas of a composition varying between only narrow limits is produced (§ 10). In this case, for any definite quantity of carbon gasified as water gas, A has a constant value, and the numerical value of B increases only with increase of the temperature at which the water gas leaves the fuel bed of the plant.

6. We have supposed that the ashes removed in the clinkering process are debited to the blow and run processes in proportion to the quantity of carbon consumed in coal, so as to allow us to deal with these processes independently. In the operation of water gas plant in actual practice, we have, however, to take into account certain changes, some of which appear generally to be lost sight of. Published chemical balance-sheets invariably show the amount of carbon removed from the plant during clinkering. This quantity, when subtracted from the total carbon supplied to the generator, is generally supposed to yield a measure of the total carbon gasified. The carbon gasified as water gas is calculated from the measured volume and composition of the water gas; and the difference between the total carbon gasified (assumed value) and the quantity of carbon in the water gas is taken to be the carbon in the blow gas.

Careful analysis of published results shows that a considerable loss may be incurred in the clinkering process through the combustion and loss of carbon which is not accounted for. Comparing the results of experiments recorded by the Research Committee of the Institution of Gas Engineers (§ 32), we find that, while the yield of water gas in Test D of Report X., was much higher than in the mean of the tests in Report VI., every factor upon which the efficiency of water gas production depends, with certain minor exceptions, should have led to a higher production in the second case than in the first. However, in Report VI. the clinkering period was 14·2 p ct. of the whole test period, while in Test D of Report X. it was only 6·1 p.ct. This leads to an explanation of the fact that the total carbon gasified (run and blow) per 100 c.ft. of water gas was recorded as 33·3 lbs. in Report VI., and only as 29·2 lbs. in Test D, Report X. The difference is probably due to the loss while clinkering, which has been wrongly debited to the blow process.

7. The total loss of carbon—that is, the carbon which is not gasified as blow gas and water gas—must obviously include two quantities, the carbon actually removed from the plant as coke, ash, and clinker, and the carbon consumed while the generator is open during the clinkering process. The latter is mainly converted into carbon monoxide by the draught of air entering the clinkering doors; the waste gases escaping through the stack valve. It will be noted that as the air current is a slow one, and as CO is therefore the main product:

(i) The loss of carbon is large relatively to the quantity of air passing through the plant.

(ii) The heat developed in the process is relatively small, and a heat balance is rapidly attained between the factors in column III.

It is probable, therefore, that we can neglect the algebraic sum of the factors under column III., and consider the carbon burned-off while clinkering as merely removed from the system. We will assume that we can do this, and so simplify the treatment of the subject.

8. If we take a ton of dry coke as the unit for experiment, and suppose that this quantity contains M lbs. of carbon, the carbon gasified as water gas and blow gas may be represented by (M – N) lbs., where N lbs. is the quantity of carbon removed from the plant as waste, and burned during the clinkering process. For the purpose of obtaining numerical estimates we will at first suppose that the coke contains 85 p.ct. of carbon, and that about 7 p.ct. (7·03) is removed and lost during clinkering. The value of (M – N) is then 1800 lbs. Neglecting the small heat change (A″+B″, &c.) taking place in the clinkering process, we can assume that a balance is arrived at in the water gas process, when x pound-molecules of carbon are gasified as water gas, per ton of coke used, and (1800 – x) lbs., or (150 – x) pound-molecules, of carbon are gasified as blow gas.

9. If then we write

$$p = a - b + c + e - f - g$$
$$-q = -a' - b' + d' + e' - f' - g'$$

when $p, a, -b$, &c., are the numerical values of P, A, B, &c., (§ 3 to 5) when these symbols are used with reference to the blow and run process operated independently when the same quantity of carbon —(say) 10 pound-molecules—is gasified in each process. Then balance would be attained when

$$p\,(150 - x) = -q\,x$$
$$x = 150p/(p + q).$$

We will now consider the blow and run processes separately, taking the run process first.

10. *The Run.*—British water gas practice, which we do not propose to criticize or to justify, aims at the manufacture of water gas approximating to the following composition:

CO_2.		CO.		H_2.		CH_4.		N_2.
5·5	..	39·0	..	49·0	..	0·5	..	6·0

The value of $-q$ for 10 molecules of carbon gasified as water gas must of course depend upon the composition of the gas produced, but it will not in ordinary circumstances vary very materially within the small range over which the composition of the water gas departs from the analysis given above. We can therefore eliminate one of the variables which effect the efficiency of water-gas production, at the expense of completeness of our analysis in a small degree, but with the advantage of simplifying the treatment of the subject enormously. As engineers are in the habit of thinking of water gas in terms of thousands of cubic feet at 60° Fahr. (15·55° C.) and 30 in. of mercury, saturated, we shall use these units throughout.

11. Taking the gas of the composition given above as our standard, and assuming that 1000 c.ft., 60° Fahr. and 30 in., saturated, is equivalent to 2·596 lb.ft. molecular volumes, we have for each 1000 c.ft. of the gas:

—	Lb. Mols. Constituent.	Lb. Mols. Carbon.
CO_2	0·14278	0·14278
CO	1·01244	1·01244
H_2	1·27204	..
CH_4	0·01298	0 01298
N_2	0·15576	..
Total	2·59600	1·16820

12. Since the basis of our calculation is to be 10 pound-molecules of carbon, this quantity is equivalent to 8560 c.ft. of water gas at 60° Fahr., &c., and contains:

	Lb.-Mols.
CO_2	1·2222
CO	8·6666
H_2	10·8888
CH_4	0·1111
N_2	1·3333

13. Supposing that 85 p.ct. of the steam supplied to the generator is decomposed, we have from the above (per 10 lb.-mols.):

	Lb.-Mols.
Steam to generator	13·0712
Steam decomposed	11·1109
Steam with gas	1·9603

14. The sensible heat of steam to generator (d') = 10,950 C.H.U.

15. The heat of formation of water gas (a') can be calculated from the CO_2, CO, and CH_4 content of the gas above, and the equations:

$$C + 2H_2O = 2H_2 + CO_2 - 20{,}900 \text{ C.H.U.}$$
$$C + H_2O = H_2 + CO - 31{,}000$$
$$C + 2H_2O = CH_4 + 20{,}350$$

Heat of formation of water gas (a') = – 291,950 C.H.U.

16. The sensible heat of the water gas leaving the plant depends upon the efficiency of the heat interchange between the water gas and the coke in the upper layers of the fuel bed. It is a variable quantity of very material importance. It can be calculated from the data given above in the manner indicated in our previous paper (*loc. cit.* par. 1). The following are the values between 400° and 1000° C.:

Temperature °C.	Sensible Heat of Water Gas. $-b'$.
400 ..	– 68,700 C.H.U.
600 ..	–104,900
800 ..	–142,350
1000 ..	–181,100

17. The evaluation of the minor factors e', f', and g' will be dealt with later.

18. *The Blow Process.*—We will again take 10 pound-molecules of carbon as our unit, but to avoid a vast amount of arithmetic, we will first suppose that the plant is blown by dry air, treating

CO_2 : CO.	1 : 9	3 : 7	5 : 5	7 : 3	9 : 1
Composition (lb.-mols.) CO_2	1·00	3·00	5·00	7·00	9·00
CO	9·00	7·00	5·00	3·00	1·00
N_2	20·69	24·45	28·21	31·98	35·74
Composition (p.ct.) CO_2	3·26	8·71	13·09	16·67	19·67
CO	29·32	20·32	13·09	7·12	2·19
N_2	67·42	70·79	73·82	76·21	78·14
Air equivalent (lb.-mols.)	26·19	30·95	35·71	40·78	45·24
Sensible heat of blow gas (b) 600°	−129,200	−149,100	−169,000	−198,950	−208,850
800°	−175,150	−202,250	−229,950	−257,400	−284,900
1000°	−222,450	−257,650	−292,800	−328,000	−361,150
Heat of formation (a)	336,250	472,100	607,950	743,800	875,650
Sensible heat of air at 20° C.	4,200	4,950	5,800	6,550	7,250

the effect of moist air separately (§ 26). We have now to consider the fact that the heat formation of the blow gas, or any definite quantity of carbon gasified, varies very materially with the nature of the product, whether rich in carbon monoxide or rich in carbon dioxide. We have, therefore, to consider the heat of formation (a) to be variable; and the best we can do towards simplifying the problem is to find a convenient way of connecting the value of a with the composition of the blow gas. This can best be done by representing the molecular composition of the blow gas by

$$CO_2 : CO = (10 - n)/n,$$

where n pound-molecules of carbon monoxide are produced for each 10 pound-molecules of carbon gasified. This system has the advantage of giving us linear relationships. We will then calculate the values of a, b, and c, for values of CO_2 : CO between 1 : 9 and 9 : 1. The data will be found in the table [at the head of this page].

19. Minor gains and losses. The sensible heat of the coke at 20° C. equivalent to 10 pound-molecules of carbon is given by

$$e \text{ or } e' = 10 \times 12 \times 0{\cdot}195 \times 20/0{\cdot}85 = 550 \text{ C.H.U.}$$

assuming that the coke contains 85 p.ct. of carbon. Assuming that it contains 12 p.ct. of ash, the sensible heat of the ashes at 300° C. is given approximately by

$$f \text{ or } f' = -10 \times 12 \times 12 \times 0{\cdot}2 \times 300/85 = (\text{say}) - 1000 \text{ C.H.U.}$$

The radiation and conduction loss is taken as 2 p.ct. on the calorific value of the fuel, distributed one-third to the blow process and two-thirds to the run process, as the loss depends upon the time of operation. We have then

g . . . . . − 12,000 C.H.U.
g . . . . . − 24,000 C.H.U.

20. Assuming that the composition of the water gas corresponds to the analysis in § 13, and that p and $-q$ each represent 10 pound-molecules of carbon gasified in the blow and run processes respectively, we can calculate their values when the following facts are known:

The temperature at which the blow gas leaves the fuel bed.
The temperature at which the water gas leaves the fuel bed.
The ratio CO_2 : CO in the blow gas.

21. The results are given in the following table:

Temperature °C.	$-q = -a' - b' + d' + e' - f' - g'$ F' − G'.
400	− 374,150
600	− 410,350
800	− 447,800
1000	− 486,550

22. CO_2 : CO	1 : 9	3 : 7	5 : 5	7 : 3	9 : 1
Temperature °C.	$p = a - b + c + e - f - g$				
600 . . .	198,800	315,500	432,300	548,950	661,400
800 . . .	152,750	262,350	371,350	480,500	585,350
1000 . . .	105,450	206,950	308,500	409,900	507,100

23. If the coke contains M lbs. of carbon per ton, of which N lbs. are lost, then (M — N)/12 pound-molecules of carbon are gasified as blow gas and water gas (§ 11), and the quantity of carbon gasified as water gas is given by:

$$x = (M - N)\ P/12\ (p + q).$$

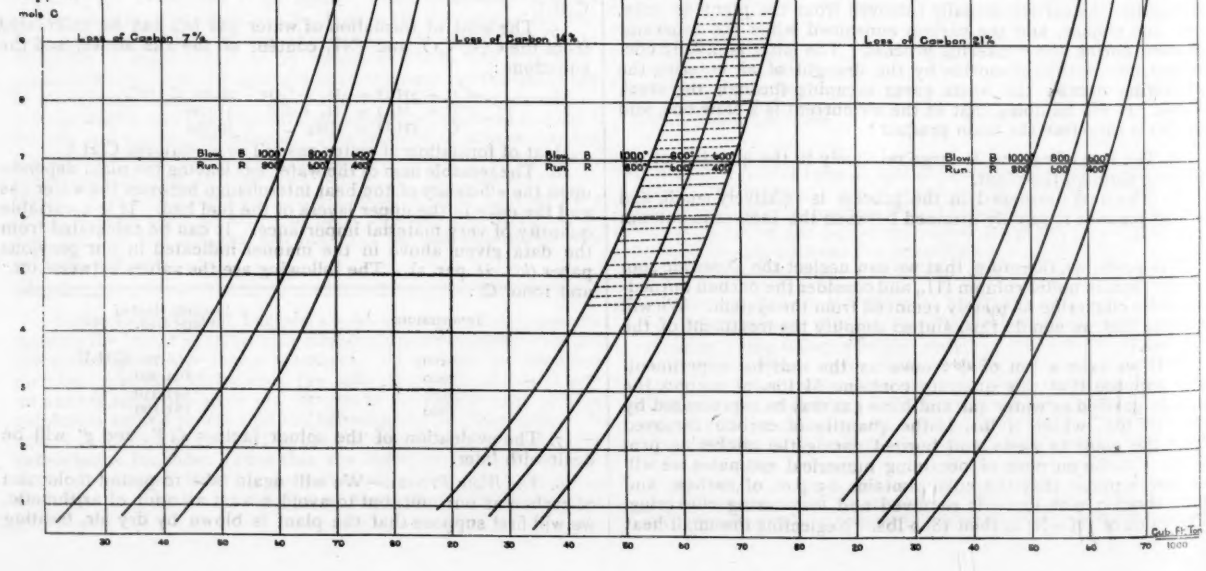
In standard water gas practice, 1000 c.ft. of gas at 60° Fahr., &c., has been assumed to contain 1·1682 pound-molecules of carbon (§ 14), so that if (M — N) is 1800 lbs.:

Volume of water gas per ton of coke
$= 150 \times 1000\ p/1{\cdot}1682\ (p + q)$
$= 128{,}400\ p/(p + q).$

24. In order to show how the variation in the composition of the blow gas and the temperature at which gases leave the fuel bed should affect the production of water gas, we have used the formula at which we have just arrived to calculate the volume of water gas produced, when, as seems to be usually the case, the blow gas leaves the fuel bed 200° C. hotter than the water gas; the latter in the three series being at 400°, 600°, and 800° C. respectively. Calculations have been carried out for the five values of the ratio CO_2 : CO which we have already dealt with. The results are set down in the following table. The figures relate to the case in which the loss of carbon is reckoned as 7 p.ct. on the total carbon in the coke, when the carbon gasified as blow gas and water gas is 1800 lbs. per ton of coke. Similar calculations have been made in the cases in which the loss of carbon was 14 p.ct. and 21 p.ct., and the results of the three sets of calculations are shown in the graph below. The shaded portion of the middle set of curves probably covers the range of practical working.

CO_2 : CO in blow gas	1 : 9	3 : 7	5 : 5	7 : 3	9 : 1
Blow Gas. / Water Gas.	Volumes Water Gas.				
600° 400° .	44,550	58,750	68,800	76,350	82,860
800° 600° .	34,850	50,050	61,050	69,250	75,500
1000° 800° .	24,450	40,600	52,400	61,350	68,200

25. That the output of water gas per ton of coke should increase with increase in the value of the CO_2 : CO ratio for the blow gas and should decrease with increase in the temperatures at which the gases leave the plant is a conclusion which can be arrived at from the general consideration of the changes in-



volved in the process. These facts are now demonstrated quantitatively. From our general knowledge of the process of the gasification of carbon by air, it might also have been predicted that the CO_2 : CO ratio for the blow gas would increase with the velocity of the blast into the fuel bed, and might also decrease with increase in the depth of the fuel. However, in none of the experiments of which the results have been published have the depth of fuel and the blast velocity been varied independently. For instance, in the experiments described in Technical Paper VI. of the Fuel Research Board, the following data are given or can be deduced from the recorded facts:

—	Depth of Fuel Bed.	Air per Minute.
	Ft.	C.Ft.
Test 3	4	4740
Test 4	7	3310

The reduction in the velocity of flow is a consequence of increasing the resistance of the fuel bed.

26. The effect of moisture in the air on the efficiency of the water gas process cannot actually be neglected, though the application of the necessary correction would have involved a vast amount of arithmetic. The following calculation based upon the case in which the air was half saturated (54 p.ct.) at 16·5° C. indicates the magnitude of the effect produced. In this case the air contains:

	Lb.-Mols.
Oxygen	0·001112
Water	0·0000275

27. We can suppose that the water is decomposed completely, yielding 0·0000275 pound-molecules each of hydrogen and carbon monoxide. We can then work out by the laborious process of trial and error the quantity of carbon monoxide and carbon dioxide produced by the oxygen in the mixture. We will take the case in which the ratio of the total CO_2 to the total CO is 5 : 5. We have then:

—	CO.	CO_2.	H_2.
From 0·0000275 H_2O	0·0000275	..	0·0000275
From 0·001112 O_2	0·0007225	0·0007498	..
Total	0·0007500	0·0007498	0·0000275

For 10 lb.-mols. of carbon

Heat of formation of H_2 and CO from water
$-666/7 \times 0{\cdot}0000275 \times 31{,}000 = -5{,}700$

Heat of formation of CO from oxygen
$666/7 \times 0{\cdot}0007225 \times 26{,}830 = 129{,}200$

Heat of formation of CO_2 from oxygen
$6667 \times 0{\cdot}0007498 \times 94{,}760 = 473{,}700$

Total 597,200

Where the air is supposed to be dry (§ 22), the heat of formation of the blow gas for the CO_2 : CO ratio 5 : 5 was found to be 607,950.

28. To demonstrate the effect of moisture in the air, we will take the particular case in which the temperatures of the blow gas and water gas were 800° and 600° C. respectively. We have now:

—	Air 54 P.Ct. Saturated.	Air Dry.
P	360,600	371,350
Q	410,350	410,350
P + Q	770,950	781,700
Volume of water gas	60,050	61,050

The difference amounts to 1000 c.ft. per ton of coke.

29. This calculation shows how important it is to avoid condensing moisture in the plant. Leakage of steam into the generator during the blow may also reduce the efficiency of gas production very considerably.

30. It is obvious that preheating the steam used in the run process must increase the efficiency of gas production, and on the other hand, that wet steam must have the opposite effect. In order to investigate the effect of preheating and of saturation, we will take cases between the extremes of preheating to 700° C. and 10 p.ct. saturation. Thus, for 10 lb-mols. of carbon gasified we have for sensible heat of steam to generator (§§ 16, 17):

	C.H.U.
1. Steam preheated to 700° C.	78,400
2. ,, ,, ,, 300° C.	32,650
3. ,, dry at 100° C.	10,950
4. ,, 5 p.ct. saturated	3,650
5. ,, 10 p.ct. ,,	−2,650

31. If we take as an example the case in which the ratio CO_2 : CO is 5 : 5, and the blow gas and water gas leave the fuel bed at 800° and 600° C. respectively, we have:

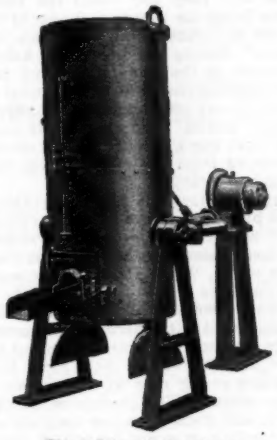
	1.	2.	3.	4.	5.
p. (800° C. CO_2 ; CO = 5 : 5)	371,350	371,350	371,350	371,350	371,350
q. (600° C.)	342,900	388,650	410,350	417,650	425,050
$p + q$	714,250	760,000	781,700	789,000	796,400
Water gas per ton coke	66,750	62,750	61,000	60,450	59,850

(To be concluded.)

THE CUPOLETTE.

The accompanying illustration shows a small emergency cupolette built by the Constructional Engineering Company, Ltd., Titan Works, Charles Henry Street, Birmingham.

The cupolette is mounted on trunnions and carried on a couple of "A" standards; this provision for tilting being to facilitate the rebricking of the shell when necessary. The fan, which is mounted upon a separate standard, requires from 1 to 2 B.H.P. to drive, according to the volume of air required. Drop doors are fitted to the cupolette, which enable the contents to be readily dropped after each blow; and the apparatus, with its special



The "Titan" Cupolette.

tuyères, pouring and slagging spouts, peep holes, &c., is really an up-to-date cupola in miniature. For normal requirements a range of three sizes is provided having melting capacities of 10, 15, and 20 cwt. per hour respectively. The consumption figures run on an average to about 2½ cwt. of coke per ton of metal brought down by this means—a figure which would be considered impossible of attainment for the production of merely a few isolated emergency castings in a special blow in a larger apparatus. It is, however, on time that this small emergency appliance shows at its best; for it is possible to have hot and perfectly fluid metal within some eight or ten minutes from the time when the blast is turned on, so that in many cases the metal can be ready before the mould.

Caracristi Lead Bath Process.

Several references were made in the course of the recent Smoke Abatement Conference at Manchester to the erection of a plant for carbonizing bituminous coal at a low temperature at the Ford Motor Works, Walkerville, Ontario. This plant, some particulars of which have already appeared in the "JOURNAL," is the outcome of research and development work carried out by Messrs. V. E. Caracristi and Emil Piron, at Huntingdon, U.S.A., where a demonstration unit with a daily capacity of 25 tons was erected for experimental purposes. Pulverized coal is spread in a thin layer on a continuous belt conveyor which floats on a bath of molten lead. The heat for carbonizing is transmitted from the molten lead to the conveyor and the coal, and is maintained at 1100° to 1200° Fahr., with 1300° as a maximum. The molten lead is kept at the desired temperature in a tank of refractory material; heat being conducted to the bath by U-shaped flues. It is claimed that no lead losses will occur through oxidation, due to the gaseous atmosphere maintained, and that no change in the lead bath will result through the effect of the sulphur which may exist in that atmosphere. Commercial results, it is said, are obtained with a coal layer ½ in. thick, and this distils completely into low-temperature coke (10 to 12 p.ct. volatile matter) in less than five minutes. The primary object of carbonizing in this manner is to obtain a residue, high in carbon, containing not more than 15 p.ct. of volatiles, and one which at the same time will burn without smoke.

SCOTTISH JUNIOR GAS ASSOCIATION.

Joint Visit to the Granton Gas-Works.

There was a joint visit of the Eastern and Western Districts of the Scottish Junior Gas Association last Saturday week to the Granton Gas-Works, Edinburgh, about 140 being present. The party assembled at Princes Street Station and were taken to the works in conveyances provided by the Corporation. On arrival they were divided into small groups and conducted by Mr. H. H. Gracie (Engineer and Manager), Mr. James Jamieson (his Assistant), Mr. Alexander (Works Superintendent), and other members of the staff.

The foundations for the new vertical retort installation attracted particular attention. This plant, which is of the Woodall-Duckham type, will cost £217,000, and will consist of two parallel lines of retorts, making a total of 88, each retort carbonizing more than 8 tons of coal per 24 hours. The daily output of gas will be approximately 11 million c.ft., and between 700 and 750 tons of coal will be carbonized. Considerable interest was also manifested in the Fairweather recording calorimeters, the details of which were explained to the visitors by Mr. Young (Assistant Works Chemist), who was to read a paper on "Recording Calorimeters" in the course of the evening.

Following the inspection, the members were entertained at tea in the Technical Office, at the invitation of the Gas Committee.

Councillor J. STEWART (the Convener of the Gas Committee) occupied the chair, and extended a hearty welcome to the Association, expressing the hope that they had found the visit both instructive and enjoyable. This being the twenty-first year of the Association, he considered that a visit to Granton, the birthplace of the Association, was most appropriate. During the life of the Association there had been great developments in the manufacture and use of gas; and he considered that the organization performed a useful function in stimulating the members. It was only by continued efforts that they were able to popularize gas, and so, by increasing the output, decrease the price. He believed there was a great future for the industry; and now that they were recovering from the effects of the war he expected to see it go from strength to strength.

Mr. H. H. GRACIE expressed his pleasure at the gratifying attendance, and associated himself with the welcome extended by the Convener. He agreed it was very fitting that they should meet at Granton in their twenty-first session, because the formation of the Association was largely due to Mr. W. R. Herring, who was then Chief Engineer and Manager, and the first President was the late Mr. Alexander Masterton, to whose memory he paid a tribute for the untiring energy and zeal he displayed in furthering the movement. He noted with interest that the Eastern District commenced with 87 members, and now numbered 130. This was all to the good; but no effort should be spared to urge every young man in the industry to link-up with this important organization. The juniors of to-day would be the seniors of to-morrow, and to carry on the work adequately they must have a thorough grounding in every branch of the profession. He emphasized the need of paying particular attention to minute details which might otherwise slip past as comparatively unimportant. He pointed out, as an example, the strides that had been made in the recovery of waste heat. On looking back over the years, and noting the improvements that had been made in this direction, they wondered why they had ever tolerated the belching-forth of smoke from the retort-house chimney. They were now utilizing this waste heat to drive the moving parts of their plant. He regretted that there was nothing spectacular to show them at Granton; but on the Association's next visit he hoped to have installed the new vertical retort plant, which would be the second largest installation north of the Border. In this new plant it was intended to use the waste heat to fire boilers for driving electric generators, from which all the power required for coal breakers, elevators, and other moving parts would be supplied. In addition, it was estimated that there would be an important surplus of steam for driving other machinery on the works. Another matter to which he had been paying particular attention, and which at first sight might be thought a minor detail, was the pulverization of breeze with the object of securing complete combustion; thus using this low-grade fuel for steam raising at very small cost. Plant for this purpose was being installed, and would be in full working order within a few months. The disposal of clinker and ashes was the bugbear of many gas managers, and at the moment he was trying to interest his Committee in the manufacture of bricks from these waste products.

A sample brick which had been made from Granton refuse was handed round for inspection, and Mr. Gracie remarked that he thought they would agree it was a very excellent production. This scheme was another instance of examining details closely, in order to make sure that everything was utilized which was likely to bring financial gain. Referring to the paper to be given by Mr. Young on "Recording Calorimeters," Mr. Gracie said he hoped members had noticed particularly the location and fitting-up of these appliances. They were practically in a huge glass-case, with a view to maintaining an equable temperature. The installation had been carried out under the direction of the Gas Referees.

Mr. Gracie went on to allude to the important appointment which Mr. Dickson had just obtained as Engineer and Manager to the Dundee Corporation, and expressed the hope that it would be an encouragement to the younger men to make the most of their youth and opportunities. Mr. Dickson was one of their very earliest members, and was their second President. His appointment illustrated the advantage to be gained, even in a material way, by association with an organization such as theirs. He was sure they would join with him in congratulating Mr. Dickson. Before resuming his seat, he also wished to convey their good wishes and congratulations to Bailie Stewart, who had been singled-out by his brother Councillors for the fifth year in succession to occupy the position of Convener of the Gas Committee. Bailie Stewart had been largely instrumental in getting the new vertical retort scheme passed through the Town Council; and confidence in his judgment had been shown by his being placed in charge until the retorts were at work.

Mr. R. L. LAING (Brechin) and Mr. M'ISAAC (Glasgow), Presidents of the Eastern and Western Districts respectively, expressed the Association's thanks for the privilege of seeing over the works, and for the hospitality which had been extended. They voiced the general appreciation of the splendid lay-out of the works.

Councillor GREGORSON (Vice-Convener of the Gas Committee), replying to the vote of thanks, remarked that, though the works were not absolutely up-to-date, their possibilities were very great. On the next visit they would see not only the best lay-out, but also the most up-to-date gas-works.

Mr. WEBSTER (Provan) and Mr. FRASER (Dalmarnock) associated themselves with the thanks expressed, and remarked on their own appreciation of the visit.

TWO ADDRESSES.

The members were then conveyed to the Heriot-Watt College, where Mr. Young (Granton) lectured on "Recording Calorimeters," illustrating his subject by blackboard sketches. His lecture was very much appreciated, and, after replying to points raised by Mr. W. A. Dearden (Dunfermline) and Mr. J Boyle (Greenock), the author was accorded a hearty vote of thanks, on the motion of Mr. R. L. Laing (Brechin).

Principal A. P. LAURIE, M.A., D.Sc., of the Heriot-Watt College, afterwards gave an address (illustrated by lantern slides), of which the following is an abstract.

THE INFLUENCE OF CALCIUM SULPHATE ON THE PROMOTION OF STONE DECAY.

In addition to the recognized causes of stone decay, such as erosion by wind, breaking-up through frost, solution in carbonic acid, and possible bacterial attack, we have to recognize that the universal burning of coal has introduced a new factor of a very serious nature, which is destroying stone buildings not only in our cities, but also in remote country districts. As a result of the burning of the sulphur in coal, sulphur dioxide is produced, which is both carried in the air and dissolved in the rain. Along with air and moisture it attacks calcium carbonate (whether as the binding agent in a sandstone or as composing a limestone) converting it into calcium sulphate, which is slightly soluble in water. If this was the main damage done by calcium sulphate it would not be so serious a matter; but the calcium sulphate crystallizes inside the stone, and by so doing breaks-up the stone, so that the mechanical destruction due to crystallization is the most serious cause of decay. Plenty of evidence of this can be found in our public buildings; sometimes large portions of stone being detached and the raw broken surface being covered by bunches of calcium sulphate crystals. The laws which govern the centres chosen for crystallization are somewhat obscure, and I do not propose to go into them here.

For some years I have been examining the decay in some of our ancient monuments in this country, at the request of the Office of Works; and during this summer I extended my observations by visiting the Cathedrals of Durham, Lincoln, Ely, and Norwich, and collected a great deal of interesting information as to the nature of the decay going on in these various Cathedrals. In every case I was satisfied that, wherever conditions exist for the formation of sulphate of lime, it is more or less injurious; but on the whole I collected evidence which favoured the view that, while we have two forms of attack—sulphur dioxide carried in the air and sulphur dioxide dissolved in rain and probably present as sulphuric acid and sulphate of ammonia—the rain has also a beneficial action, washing out some of the sulphate of lime and therefore tending to prevent its accumulation to the point of dangerous crystallization. This makes the situation not quite so hopeless as it formerly appeared, as it suggests the possibility that, by the combined use of a suitable protective agent with the washing of public buildings, it may be possible at any rate in some cases to assist the action of the rain and prevent an undue accumulation of sulphate of lime.

I also accumulated evidence on two other interesting points. I found cases where, owing to a siliceous sandstone having been used, the building should have been immune from attack; but apparently the necessary lime required to trap the sulphur dioxide had been supplied from the mortar or cement used in pointing the building. The other interesting piece of information was the extraordinary extent to which this distribution of sulphur dioxide is taking place over the whole countryside. Not only remote buildings like Elgin Cathedral, Rievaulx Abbey, and Tintern Abbey show some 2 or 3 p.ct. of sulphate of lime in the decaying stone, but even Ely Cathedral, isolated in the Fen country, with only a small village at its door, shows plenty of pollution from sulphur dioxide both inside and outside the building. No attempt, as far as I am aware, has been made by those engaged in investigating smoke pollution to estimate the amount of sulphur dioxide carried in the air from big centres of population to remote country districts. The only figures I have been able to find are analyses made many years ago of the amount of sulphate present in the rainfall at Rothamsted. It is, I think, of importance that the investigation of the Smoke Pollution Committee be extended with a view to examining this question, as this widespread destruction of our ancient buildings, even in remote districts, is a very serious matter.

A cordial vote of thanks to Principal Laurie, for his kindness

and interest in the Association, was moved by Mr. M'ISAAC, and the members heartily responded.

This concluded the programme of a very successful joint meeting.

CENTRAL AND SEPARATE PRODUCERS.

In "Das Gas- und Wasserfach" for Oct. 4, Dr. R. Geipert, of Berlin, contributed some interesting observations on this subject. Much, he says, has been advanced in recent years both to the advantage and disadvantage of central producers for heating retort settings, and most carbonizing plants lend themselves either to this or to the more usual system. The Schöneberg (Berlin) Works last year were faced with the problem which to adopt, when they were constructing new carbonizing plant there. The plant in question consists of large vertical chambers with 24-hour carbonization period, for which either separate or central producers would be suitable.

In favour of the central system was the low percentage of unconsumed coke in the clinkers. This can be estimated in figures; and it can be definitely taken that central producer clinker contains 25 p.ct. less coke than that of ordinary producers. This means that, on every 75 parts of ash, about 25 parts more of coke are lost in separate-producer working than in the central system. Taking, for example, 1 lb. of coke with a 16 p.ct. ash content, this makes $0{\cdot}16 \times 25 \div 75 = 0{\cdot}053$ parts, or, on 100 lbs. of coal carbonized, with a producer consumption of 15 lbs. of coke, $15 \times 0{\cdot}053 = 0{\cdot}8$ lb. of coke. On the other side, and against the central producer, had to be set its requirements in electrical energy and in cooling water; and these were taken, per 100 kilogrammes [220 lbs.] of coal carbonized, at 0·2 KW.-hour and 0·36 cub.m. [80 gallons]. The cost of these at the time worked out to the then current selling price of 1·7 kilogrammes of coke (*i.e.*, per 100 kilos. of coal carbonized). Small coke below 15 mm. [0·59 in.] would not have been available for use in central producers, since, at the Schöneberg Works, it is all used in the boilers. In all central producers the fuel must be screened, whereas in the ordinary system it is used direct from the retorts —*i.e.*, with a good proportion of duff of low value. Central producers can, of course, be credited with a certain saving in wages, but so small that it is probably offset by the higher running repairs required by this system. The author hardly anticipates that central producers could improve on the durability of the Mariendorf vertical settings with ordinary producers, which have shown that 4000 carbonizing days are attainable.

After consideration of the above points, the ordinary system of separate producers was decided upon, with water-cooled step-grates. With the waste-gas heat, steam of 6 atmospheres is produced for nothing. The whole of the waste steam is available for other purposes; none of it being required for grate cooling, as is the case with central producers.

The results have been fully up to expectations, and the author is able to give the average results of an eight-day run, in which the coal carbonized was of more or less uniform quality—Upper Silesian screened.

Coal carbonized in 24 hours	139·1 tons.
Gas, debenzolized at 15° C.	2,330,000 c.ft.
Do. do. per ton of coal	16,755 c.ft.
Calorific value of gas	501 B.Th.U.
Nitrogen in gas	5·3 p.ct.
Total coke fired	24·7 tons.
Recovered from clinker (above 0·8 in.)	3·1 ,,
Coke actually used	21·6 ,,
Actually used per 100 lbs. of coal carbonized	15·6 lbs.
Do. do. ton of coal ,,	3·12 cwt.
Do. do. per 1000 c.ft. of gas	21 lbs.
Surplus steam per 100 lbs. coal	20 ,,

In Herr Geipert's opinion, there should be deducted from the coke consumption in the producer the amount of fuel which would have been required to produce the 20 lbs. of steam in the boiler house. This he estimates at 2·5 lbs., reducing coke to producers per 100 lbs. of coal carbonized to $15{\cdot}6 - 2{\cdot}5 = 13{\cdot}1$ lbs. [or 2·62 cwt. per ton]. In this process, however, not only is the specified quantity of coal carbonized, but, at the same time, water gas is produced in the chambers, to the amount of about 43 c.ft. per ton of coal. To produce this in ordinary generators would again require coke, which may quite fairly be deducted from the coke actually consumed in coal carbonization, still further reducing this to an estimated amount of 9·4 lbs. per 100 lbs. of coal, or 1·88 cwt. per ton of coal. If the ash in the coke be put at 15 p.ct., this leaves a consumption of 1·60 cwt. of pure coke in the producers per ton of coal carbonized.

The author is of opinion that this result could not have been improved upon at Schöneberg by introducing the central producer system. On the contrary, he considers that separate producers have fully justified themselves, and have been proved to be by no means out of date.

Midland Junior Gas Association.—Arising out of the presidential address delivered by Mr. H. Clarke on Oct. 31 (see "JOURNAL" for Nov. 5, p. 351) a proposal was made that the section dealing with power should be further discussed. For this purpose a meeting will be held next Friday, Nov. 21, at 6.15 p.m., in the Reading Rooms, Gas Department, Council House, Birmingham.

CHALMERS' SALE OF GOODS ACT.

Reviewed by a Barrister-at-Law.

A new edition,* the tenth, of this widely read book on the Sale of Goods Act, 1893, has just been issued by Sir M. D. Chalmers, K.C.B., who, as is well known, was the draftsman of the Act. The new edition relates not only to the Sale of Goods Act, 1893, but also to the Factors Acts, 1889 and 1890, and it contains a useful appendix in which are set out the provisions of several important Acts which relate to the sale of goods. The effect of recent decisions has been noted, so that the case-law has been brought up to date.

In our view, the new edition will be found to be very useful by all engaged in commercial transactions inviting the purchase or sale of goods. Though, of course, it is true that any purchaser and any vendor may enter into any form of bargain, yet the Act applies to all ordinary cases of purchase or sale of goods in respect of which no special contract is made. Such transactions form by far the larger part of daily commercial operations; and readers of the "JOURNAL" will find in this book, in convenient and easily understood form, the code of rules which, in the absence of special contract, apply, together with notes of judicial decisions interpreting or explaining the code which forms the Sale of Goods Act. The edition is sub-divided into convenient headings, is well printed, and is furnished with a comprehensive index, a full table of contents, and tables of cases.

* "Chalmers' Sale of Goods," tenth edition, by Sir M. D. Chalmers, K.C.B., C.S.I. London: Butterworth & Co.; 15s. net.

GLOVER-WEST VERTICAL RETORTS.

Recent Contracts.

Some of the contracts recently placed for Glover-West vertical retorts are of considerable interest. The first installation at the Blackpool Corporation Gas-Works, consisting of 24 retorts, was erected in 1912. This was extended in 1915 by the addition of a further 24 retorts in the same bench, making a total capacity of 1½ million c.ft. of gas per day. The plant was erected in a building originally intended for the extension of the inclined retort bench built by West's Gas Improvement Company in 1901. In August of this year a contract was placed with the same firm for the removal of the inclined retort bench and for building another installation of Glover-West vertical retorts in its place, which will comprise 48 retorts of the new large model, 40 ft. by 10 in. at the top, with a daily capacity of nearly 4 million c.ft.

The Leicester Corporation already possess four benches of Glover-West verticals. The first was erected at the Belgrave Gate Works in 1913, and consisted of 80 retorts with a daily capacity of about 2½ million c.ft. This was extended by the addition of another bench of 32 retorts in 1920. At the same time, 64 retorts were built at the Aylestone Road Works. This was followed by the erection in 1923 of a bench of 56 retorts of the 33-in. new model with a daily capacity of 3½ millions; and a contract has now been placed for the erection of 64 retorts of the 40-in. new model, with an estimated capacity of 5 million c.ft. of gas per day.

The existing installation at Holywood in Ireland is to be extended by the addition of four retorts of the new model; and the fifth setting at Perth, which was arranged as a shell when the plant was originally erected in 1922, is to be completed, making a total of forty retorts with a daily capacity of 2 millions. At Formby, in Lancashire, an interesting small installation, comprising six retorts of the 21-ft. model, has been contracted for.

But certainly the most interesting of the recent contracts is that arranged by Mr. J. Ferguson Bell, President of the Institution of Gas Engineers, for the dismantling of the semi-continuous vertical retorts at the Cavendish Street Works of the Derby Gas Light and Coke Company, and the installation of Glover-West retorts to replace the existing vertical settings. The existing building, steelwork, and coal-handling plant will be used again, and forty retorts will be installed of the 21-ft. new model. When the Institution pay a visit to Derby in June next, members will be able to see this plant approaching completion.

Abroad there is the contract for a 5-million plant at Toronto, Ontario, where in 1912 West's Gas Improvement Company, Ltd., installed one of the latest developments of their stoking machinery. The Prague Municipality, Czecho-slovakia, have placed a contract with a combination of firms—the Compagnie Générale pour la Fabrication des Compteurs, of Paris, West's Gas Improvement Company, of Manchester, and Messrs. Novak and Jahn, of Prague—for the construction of a complete new gas-works on the Michli site, which will include eighty retorts of the large Glover-West new model. The same Parisian firm have also secured a contract for the erection of 32 Glover-West vertical retorts at the Toulon Gas-Works, and West's Gas Improvement Company of America have booked a contract for sixteen retorts of the new model to be added to the existing installation at Portland, Maine.

SMOKE ABATEMENT CONFERENCE.

MANCHESTER, NOV. 4, 5, and 6.

Further Notes of the Proceedings.

We resume to-day our review of the proceedings at the conference recently held in Manchester under the auspices of the Smoke Abatement League of Great Britain, some portion of which was dealt with in last week's issue.

LEGISLATION.

THE LAW AGAINST SMOKE.

Mr. JOHN W. GRAHAM, M.A. (the Chairman of the League), explained the present position of the law on the subject of smoke, and then went on to suggest the direction in which he thinks reform might be accomplished. He would like to see a new Act, rather than a series of complicated amendments to the existing one. The word "black" should be omitted. The principal clause in the Bill of 1914 was not quite satisfactory, and it would be simpler and safer if it ran thus:

> Any person using or suffering to be used any furnace shall, in the event of smoke or ash, grit, or other particles being emitted therefrom for periods longer than two minutes in the half-hour, if he is the occupier of the premises, or the fireman or other person employed by such employer, be liable, &c.

The provision which constitutes the making of manufacturing smoke a nuisance should be the first and principal clause in the Bill. The penalties should be on a higher scale, and the fireman as well as the owner and manufacturer should be liable; but a clause safeguarding the manufacturer against accidents should be inserted. It is also important that the Act should include railway trains, steamships, traction engines and all road vehicles, and Government establishments. The small local authorities are ineffective through local influence; and some means should be found by which they may be concentrated. Progressive opinion, he thinks, favours an *ad hoc* authority, with delegates from each of the local councils included in it. The Board of Health should employ six or more highly skilled scientific inspectors, to keep local authorities up to the mark. Manchester allows two minutes of black smoke in the half-hour without prosecuting; and this limitation might be put into the Act, with an appeal proviso.

PUBLIC HEALTH ACT, 1875.

Mr. R. MORTON ROWE (Chief Smoke Inspector at Manchester) discussed the "Possibilities of Smoke Prevention under the Public Health Act, 1875," and after enumerating the existing provisions declared that the improvement in those districts which have properly carried them out points to how great a betterment there would be if all the other communities had fallen into line. There is a strong weapon to hand for dealing with manufacturing smoke. This requires strengthening and extending, with power to inflict larger, and possibly cumulative, penalties. Few local authorities are carrying out their duties in regard to the smoke nuisance clauses, and a scheme for uniformity of administration and practice is required, coupled with powers to compel all local authorities to adopt and carry it out. The latest development of forming Regional Committees to ensure uniformity of administration and practice, is a step which can be made very useful and fruitful in the abolition of black smoke. It will depend, however, he thinks, very largely on the backing given to it by the Ministry of Health.

OPINIONS OF DELEGATES.

Mr. C. E. STRONMEYER (Chief Engineer to the Manchester Steam Users' Association) said people want to know what is smoke, and how it can be prevented. The invisible smoke, to his mind, is far more injurious than visible smoke. It is the invisible sulphurous acid that is so harmful. The trouble is not so much the blackness as the impurity of the atmosphere.

Mr. E. KILBURN SCOTT expressed the view that what is required is more legislation. Engineers know how to do what is necessary, but no one will spend the money on the processes until compelled. The authorities will not allow any bituminous coal to be consumed in New York, and the same thing could be done here.

Mr. C. ELLIOTT (Hon. Secretary) pointed out that the League is purely propagandist. They invite the co-operation of those who are qualified to tackle these matters.

Mr. T. ROBINSON (Brighouse) also thought existing legislation needs strengthening. Local authorities should set an example to private employers.

MINISTRY OF HEALTH VIEWS.

Mr. DAWES (Ministry of Health) said a remark had been made by the Chairman (Dr. R. Veitch Clark) that repressive action has brought about a state of efficiency in a large number of districts in this country. He was sorry to say this has not been his experience. As a matter of fact, the powers that the local authorities now possess have not been so used that one would say the highest point of efficiency has been reached in more than a very few districts in the country. Why have not the local authorities used the powers they already possess? How is it in Manchester that they can successfully work the Act, while other local authorities having precisely the same powers do nothing, save that some of them attend conferences? That is a problem which needs dealing with. Though not opposed to new legislation, he urged that the legislation already in existence has not been applied, and that if there is new legislation the will to enforce it will not come with the mere passing of the Bill—and this is what is lacking. If the present powers were enforced as they are in Manchester and one or two other places, there would be a very different tale to tell with regard to black smoke. The Ministry know that there is no uniformity whatever in the method of administering the smoke clauses of the Public Health Act. Some months ago the Lord Mayor of Manchester called a conference of the local authorities around Manchester. They met and appointed a Committee to consider whether it would be possible to secure uniformity in methods of administration so far as that part of Lancashire was concerned. Other Committees may be formed. At any rate, the experiment would be watched by the Ministry with great interest. Glasgow is also doing fine work in connection with smoke abatement.

LOW-TEMPERATURE CARBONIZATION AND SMOKELESS FUEL.

In last week's issue [pp. 429, 434] there was published the paper which Mr. Harald Nielsen contributed to this section, and a statement made by Dr. C. H. Lander (Director of Fuel Research under the Department of Scientific and Industrial Research). To-day we indicate the lines on which the other two papers were prepared.

SIR WILLIAM KAY'S WELCOME.

Alderman Sir WILLIAM KAY, J.P. (the Chairman of the Manchester Corporation Gas Committee), presided over this session, and extended a cordial official welcome to the delegates. Referring to his Department, he pointed with pride to the fact that, in spite of the slump in trade, there had in the past year been the remarkable increase in gas consumption in Manchester of 725 million c.ft. Those who have lived in Manchester, he went on, are bound to admit the great improvement in atmospheric conditions, for which improvement gas is largely responsible. He recalled being present, during the troublous days some time ago, at a conference between Lord Moulton and the Gas Committee, when Lord Moulton said: "You must not forget that the men I have before me control a section of the most important business in this country for the winning of the war, and you must not forget that the gas industry, properly handled, and with vision, controls to-day, by the destructive distillation of coal, the economic future of this country." Now the meeting was concerned with the low-temperature carbonization of coal, and he wanted to say, as Chairman of the Gas Committee, that if these gentlemen would come along with an economic scheme, which would show a little more profit than is being obtained to-day, they would receive a hearty welcome; but they must be convinced that one scheme is better than another before they consent to "swop horses in the middle of the stream."

MACLAURIN SMOKELESS FUEL PLANT AT GLASGOW.

Mr. ROBERT MACLAURIN submitted the first paper, which described the Maclaurin smokeless fuel plant now being installed at the Dalmarnock Gas-Works of the Glasgow Corporation by Messrs. Blair, Campbell, and M'Lean, Ltd., of Govan—the general lay-out having been installed by them in consultation with Mr. J. W. M'Lusky (Engineer and General Manager of the Gas Department), Mr. Harrison (Chief Engineering Assistant), and Mr. Fraser (Manager of the Dalmarnock Works). The result is the evolution of what the author considers will be a very compact and satisfactory installation. The type of coal preferred will be of the low-coking variety, which has a small percentage of ash.

The Glasgow installation consists of a battery of five units, each unit being capable of carbonizing 20 tons of coal per day of 24 hours. The height from the charging hopper of the producer to the discharging shoots is 36 ft., and the internal width at the widest part is 8 ft., tapering upwards and downwards. Every hour after heating-up a discharge is made, and approximately a ton of coal admitted. After 20 hours the first charge of coal will be approaching the combustion zone, and at from 25 to 30 hours the first coke made from the coal added (coke is used in the first place for heating-up) will be withdrawn. It thus takes 20 hours to raise the coal from 15° C. to the desired coking temperature, which is about 700° C. higher. The coal drops about 1 ft., and rises in temperature some 35° C., per hour. This very gradual increase in temperature is said to modify the nature of the coke, so that it is quite different from the usual gas-works product. In fact, the coke is sometimes so little changed from the original coal that it is difficult to believe it has been carbonized at all. Usually, however, it is much more open and cellular in structure than the original coal, but the shape has varied very little. The distortion becomes greater the higher the coking index of the coal used. It is hardly correct to term this coke a low-temperature coke, for it has been heated to a temperature well above 600° C., and it has lost all the original volatile matter of the coal, with the exception of from 3 to 4 p.ct. It, however, ignites quite readily, if the temperature has not been taken too high. When the temperature is raised beyond a certain degree, a complete change takes place in the character of the coke, which, from being black, changes to a silvery grey. From the Scotch coals tested, which contained from 6 to 10 p.ct. of moisture and from 30 to 35 p.ct. of volatile matter, about 55 p.ct. of smokeless fuel has been obtained.

Before coke is withdrawn it has to be cooled, and for this purpose steam is blown-in at the discharging shoots, forming water gas. At the combustion zone, air at 60° C. saturated with water

vapour maintains the temperature by burning-out a portion of the carbon in the coke, and producer gas is made in this zone. This hot producer gas passing up supplies all the heat necessary for carbonization. The calorific value of the combined gases is round about 240 B.Th.U., and the plant is guaranteed to provide gas varying within 5 p.ct. of this value. The volume of gas made is also guaranteed to be not less than 25,000 c.ft. per ton of coal. The gas, after passing through special-type Blair tubular coolers, is taken to two mechanical Maclaurin patent centrifugal scrubbers, where it is brought in contact with a very fine mist of liquor. After measurement most of the gas goes to a holder, to be used for heating vertical boilers in the Dalmarnock Gas-Works. A small part, however, is by-passed through a second meter to a Bonecourt boiler, to raise steam for the Maclaurin plant. The plant, of course, also yields oil and ammonia.

In a four days' trial by Glasgow Corporation chemists with the experimental installation at Grangemouth, the thermal efficiency worked out at 88·75 p.ct., when no deduction was made for the steam used. Making allowance for the gas required for raising the necessary steam, the efficiency is reduced to 86·5 p.ct.

COALITE.

The Rt. Hon. GEO. H. ROBERTS submitted a paper prepared by himself and Mr. P. C. Pope on the "Coalite" of Low-Temperature Carbonization, Ltd. He referred to the recent Fuel Board test of the plant, the report on which, he said, generally speaking admits that the installation at Barnsley does approximately what the Company have claimed for it. The next stage is to prove the economic possibilities of the system; and the Company are engaged in this endeavour. Others also have made marked progress in the solution of the problem, and, of course, the general results must be placed at the disposal of the country, because individual interests cannot be allowed to stand in the way of national considerations.

The paper set forth that the real pioneers of the modern low-temperature carbonization Coalite process were the late Mr. Thomas Parker and Mr. F. W. Salisbury-Jones. The system consists in the heating of coal, without any previous preparation, in closed retorts for about four hours, to a temperature of about 1000° to 1100° Fahr. (say 550° to 600° C.). The result of this partial carbonization is to drive-off a considerable proportion of the volatile matter of the coal, the valuable products of which are recovered, while the residual fuel, Coalite, containing about 8 to 10 p.ct. volatile matter, is left behind. This is the main product. Thus, as an average, a ton of coal of 25 to 35 p.ct. volatile matter subjected in this way to low-temperature carbonization, gives 13 to 14 cwt. of Coalite, together with 16 to 20 gallons of valuable Coalite crude oil, from which motor spirit, lubricating oil, and Diesel engine or fuel oil and disinfectants can be separated. Further, it gives about 12 to 15 lbs. of sulphate of ammonia, and 3500 to 6000 c.ft. of very rich gas of 700 B.Th.U. per c.ft., after stripping it of its motor spirit.

A contract has been made with the Nottingham Corporation, who have undertaken to purchase a minimum of 2,000,000 c.ft. per day of standard quality gas for a long term of years. A contract has also been entered into with the Digby Colliery Company to acquire a lease of land for the erection of plant capable of carbonizing, by the Parker low-temperature process, 1000 tons of coal per day. A further contract has been entered into with the Digby Colliery Company for all the coal for a period of 25 years. The annual output of the plant will be:

Gas	1,260,000,000 c.ft.
Coalite smokeless fuel	235,000 tons.
Fuel oil and lubricating oil	6,300,000 gallons.
Motor spirit	900,000 gallons.
Sulphate of ammonia	2,280 tons.

Large quantities of coal from the Digby Colliery Company have been treated at the low-temperature carbonization works at Barnsley. Upon the results obtained, it is estimated by the engineers that the profit on the new plant, the capital cost of which will be about £400,000, will be in the neighbourhood of £140,000 annually, after making provision for maintenance, depreciation, administration charges, &c.

SOME REMARKS.

Mr. E. KILBURN SCOTT said one can burn in an open grate fuel containing only 1 p.ct. of volatile matter. It is not cheerful, but it will burn.

Mr. MACLAURIN stated that his experience has been that a perfectly sound smokeless fuel is obtained when the volatile is between 3 and 4 p.ct.; but one can get high-temperature coke with even 4 p.ct., and it will not burn.

Mr. EVAN ROBERTS, jun., remarked that his difficulty was that he found the carriage cost him more than the Coalite delivered to his office. He suggested that the big corporations should select the best low-temperature carbonization system, and erect a small plant at their gas-works so as to supply the smokeless fuel for which people would be willing to pay something extra in order to secure a clearer atmosphere.

Mr. C. W. LASKEY (Eccles) said that as the result of experience in his town they will continue to use Coalite so long as they can get it at anything like the existing price of 56s. a ton delivered in the siding, from which they have to cart it. To his mind it is superior to both coal and gas. It can be used in any domestic grate; but he has found it most successful in those grates constructed on the well principle, where the air is supplied at the bottom. If it is difficult to persuade the British public to give up the open fireplace, here is a fuel they can use.

ATMOSPHERIC POLLUTION.

Dr. J. S. OWENS (Hon. Secretary to the Advisory Committee on Atmospheric Pollution, Meteorological Office, Air Ministry), dealing with the subject of "Air Pollution," remarked that, in the absence of smoke, a city such as London would in the winter receive twice as much sunlight as at present. It is very important to obtain accurate data with regard to the pollution of the air by smoke. There is a profound psychological effect upon a city when it is shown that the air which its inhabitants have to breathe and live in is abnormally dirty. This is often the first step towards producing an effort for improvement. Again, when a city has undertaken steps to keep its air pure, it is advisable to have some means of measuring the degree of success attained. Another interesting aspect of the use of such measurements is that they disclose the fact that health resorts credited with pure air sometimes suffer considerably from impurities carried to them from neighbouring cities. This is a point which has not received much consideration in the past, as it has been assumed that impurities produced in cities disappear in some mysterious way before the open country is reached. This is not the case. On the contrary, such impurities travel for hundreds of miles, and the smoke produced in the manufacturing districts of the Midlands can be detected on the south coast of England.

The methods used in examining the degree of pollution of the air by the Advisory Committee were explained, and in conclusion the following suggestion was made by Dr. Owens to enable the audience to visualize the enormous numbers of small dust particles suspended in the air of a city like Manchester: Suppose that one of the persons now responsible for the production of smoke in Manchester were condemned to count the number of particles of such smoke which he breathes in one week in the winter—if he counted at the rate of one particle per second, and worked 12 hours a day without intermission (assuming his Union permitted this), it would take him 54,600 years to complete the count.

Dr. J. R. ASHWORTH (Rochdale) showed some diagrams relating to the measurement of atmospheric pollution in a Lancashire town. These dealt, as a matter of fact, with records taken at Rochdale. He was able to make the gratifying statement that the amount of deposit is steadily diminishing in that town, though, at the same time, he fears that some of the improvement is due to bad trade. The taking of records assists progress, and other towns should adopt the practice. Factories in Rochdale are responsible for not less than 50 p.ct. of the smoke—and perhaps more.

Mr. W. J. SMITH (Bolton) inquired if any attempt has been made to differentiate between free carbon and tarry matters.

Dr. OWENS replied that tarry matter is separated from carbonaceous matter, but it must not be assumed that the former is the injurious part. It is very small in proportion to the carbonaceous portion, and its greatest effect is to cause the carbonaceous part to stick to what it falls upon. The injurious part is the solid matter and the sulphur.

DOMESTIC CHIMNEY V. FACTORY.

Councillor E. D. SIMON (presiding over one session) referring to a doubt cast by the Lord Mayor at proceedings earlier in the day upon the estimate given in his (the speaker's) book "The Smokeless City," that 75 p.ct. of the smoke is due to domestic fires, pointed out that some confirmation of this calculation is to be found in a recent report by Dr. Osborne (the Medical Officer of Health for Salford), who after careful investigation has found that just under 6000 tons a week of coal are burned in Salford factories, and over 11,000 tons weekly in winter in domestic fires. Prof. Cohen has estimated that of all the coal burned in domestic grates about 5 p.ct. goes up the chimney, and escapes as soot. This means from Salford domestic chimneys some 600 tons of soot weekly, as compared with an amount of soot from factories (reckoned at ½ p.ct.) of only 30 tons a week. This made out the soot from the domestic chimneys to be twenty times as much as from the factories. It seems, he added, an extraordinary figure, and is one that does not agree with the Lord Mayor's views.

EFFECT OF ATMOSPHERIC IMPURITIES ON BUILDINGS.

Sir FRANK BAINES (Director of H.M. Office of Works) gave a lecture, bountifully illustrated by lantern slides, in which he demonstrated clearly the effect of noxious vapours upon buildings. It is a subject with which he is admirably qualified to deal, inasmuch as he has under his charge over 6000 buildings of all classes, situated in every part of the country. The main criminal in the matter, he declared, is the domestic grate.

It is hoped to have an opportunity of noticing this lecture at length in the next issue of the "JOURNAL."

DEPARTMENTAL COMMITTEE ON SMOKE ABATEMENT.

Prof. J. B. COHEN, of Leeds, gave some account of the work of the Departmental Committee on Smoke Abatement, and in the course of his lecture exhibited a number of valuable lantern slides illustrating the damage done to plants by smoke. He referred to some experiments carried out to ascertain the amount of solid matter given off during the domestic burning of coal. His first experiments gave a figure of 5 p.ct., which seemed to him so extravagant that he concluded some mistake must have been made. In consequence, he repeated the whole of the work, with the help of one of his students, taking different kinds of Yorkshire and

Lancashire coals. The grate used was an ordinary old-fashioned iron one. The second series of experiments gave something like 6 p.ct. of solid matter given off in the domestic burning of coal. There is very little doubt in his mind that about 6 p.ct. is correct, but at the same time he would like someone else to make the same experiments. It seems to him that the Fuel Research Board is the proper authority to take up a question of this kind.

Proceeding to his subject, he pointed out that the tar in soot is material which clings to everything, and is cumulative in its effect. From an ordinary domestic grate, 25 p.ct. of the soot is tar, while from a boiler chimney the proportion is very small indeed—about 1·14 p.ct. at the top. Tar gets into the pores or stoma of certain leaves, and the plant suffers severely. Also the sticky matter covering leaves keeps from them light which is essential for their welfare. Further, capacity for assimilation of carbon dioxide suffers enormously, as photographs taken of shrubs, &c., near Leeds, as compared with others from localities more removed from the city, clearly show. Soot is always acid, due to the sulphuric acid from the coal. This acid attacks the leaf, and corrodes it. The acid also has an effect on the soil, to which it is carried by the rain. This was demonstrated by photographs of boxes of seedlings placed in different locations. The soil was the same; the only variable factor being the rain water. Yet the difference in the appearance of the plants was very striking.

Mr. W. M. Mason said they had that evening had a wonderful picture of the wrong side of things, and in the exhibition at the City Hall would be found the companion picture depicting the solution of the problem. Both the lecturers knew the solution.

Effect of Light on Health.

Prof. Leonard Hill, M.B., F.R.S. (Director of the Department of Applied Physiology at the National Institute of Medical Research), gave a lecture on "The Effect of Light on Health," which will be reported next week. On the same evening, the main portions of the lecture were broadcasted by him from the Manchester station.

Light is Health.

Dr. R. Veitch Clark, M.A. (Medical Officer of Health for Manchester), followed on the same subject. It seems to him an extraordinary thing that at this time of day people should be discussing the effect of light upon health. The value of sunlight is known; yet nothing is done, compared with what could be done, in industrial centres to produce the conditions in which it is known that people ought to live. It is over twenty years since sunlight really began to be used for the cure of diseases. For this period it has been well known to the medical world, and for the latter part of it has been known to all, that solar radiations are actually an efficient and necessary treatment of given diseases; and yet knowing as people do that it cures diseases, no precautions are taken to ensure that it induces health. If sunlight can cure disease it can produce health, and every endeavour must be made to inculcate into the public mind the fact that light is really health.

Sunlight is essential to plants for the storing-up of plant foods. There is no break of continuity in the organic world. Vegetable life and animal life, right up to man, are continuous; and if it is found that sunlight is fundamentally absolutely necessary for the normal life of a plant, it must be equally true that sunlight is essential to our personal welfare. Tuberculosis, rickets, and septic conditions are probably the three main crops of diseases that have been directly tackled by sun treatment.

Dr. H. A. des Vœux (who was Chairman of the session) complained of the apathy of the public, while admitting that this apathy is a little less now than was the case 30 years ago.

Fresh Air and Sunshine Committees.

Mrs. Higgs remarked that this "smoke pall" is a comparatively recent evil. Now woman's life has been made a contest with dirt. Lancashire has invested thousands of pounds in hospitals, &c., which, if only it had been invested in fresh air and sunlight, would have done more for the sick people than anything else. This is a preventable trouble. Is everything to be reckoned by money? Is it not true that the absence of sunlight has taken out a great deal of brightness from life? If branches of the League are formed in different towns, they should have some such appealing name as "Fresh Air and Sunshine Committees." This would result in double the amount of support likely to arise from talking about smoke abatement.

Medical Profession and Gas Fires.

Mr. F. W. Goodenough wished to say a word of consolation to Dr. des Vœux, who was troubled about the apathy of the public on the subject of the smoke evil. In Mr. Goodenough's view this apathy is not so great as Dr. des Vœux imagines; but the public are acting, and not talking. There has, he went on to say, never been such an increase in the use of smokeless appliances in the homes of the people of London—and he believes it is true of the country as a whole—as during the past two or three years. Each year shows a progressive increase in the installation of gas appliances in place of coal; and it is an interesting fact that the lead in this direction has been given in London, as elsewhere, by the medical profession. The highest consumption of gas per acre anywhere in the residential district of London is in the districts of Harley Street and Wimpole Street, which are occupied by the leading physicians and surgeons of the country. It is typical of that district to find gas fires in the consulting rooms. This is a most complete answer to the point lately raised by a Medical Officer of Health not very far removed from Manchester, who in a recent report laid a great deal of stress on the supposed dangers of carbon monoxide in the flue gases from gas fires, which pass up the chimney and have no effect on the atmosphere of the room in which the fire is used. It is mere nonsense to talk of gas fires as a menace to the public health. Gas fires and cooking stoves have done more than anything else in the last twenty years to increase the hours of sunshine and bring down the death rate of this country. When people wish for smokeless fuels, they should remember that their gas-works produce both gas and coke—two commodities which are already doing an enormous amount of work in the reduction of smoke and in the saving of life.

SMOKE ABATEMENT FROM THE MECHANICAL ENGINEER'S POINT OF VIEW.

Wollaston Pre-Coking Producer Device.

Mr. T. Roland Wollaston contributed the first of five papers which were down for this section; his subject being "The Complete Gasification of Coal—its Bearing upon Smoke Prevention and Fuel Economy." In introducing it, he said: "Since advance copies of this small paper were circulated, several friends have suggested that I have tried to throw cold water over low-temperature carbonization systems. I hope this reproach is due rather to their hurried reading than to my faulty exposition, because nothing has been further from my mind. I wish ardently to support and encourage every sincere effort to utilize coal to the best advantage. In the solution of the smoke evil, the gas and electrical engineers must join hands. The unit of electricity, under modern power station conditions, involves the consumption of between 16,000 and 17,000 B.Th.U. in gas. The complete gasification of coal in gas producers provides many times more thermal units than any retorting system. My whole point is that, in the economical generation of electrical energy, bye-products in any form, though helpful as rebates, are secondary to squeezing the fuel for the last available thermal unit. It is in this connection alone that I set forth the relative values of fuel systems from the power station view-point. In other industrial circumstances it is, I think, obvious that each distillation system has its own special field and particular value." He added that his submissions were entirely corroborated by Lord Gainford in the letter which appeared in "The Times" of Oct. 13.

In the apparatus Mr. Wollaston described, and upon which he has been working for several years,* the fuel, before dropping into the producer, is subjected, while spread out in thin layers and kept in motion for a period of upwards of 90 minutes in a "retort" above the producer, to a heating or coking process by contact with the outgoing producer gas. This outgoing gas picks-up in its course the more volatile distillates, and becomes considerably enriched thereby; and the final fuel fed to the producer is so far coked that, no matter what its original nature, it is of such size and in such condition as to be readily workable, and, due to its then porous nature, workable at very high rates. Two years' practical tests and a somewhat careful analysis over the industrial areas of the country indicate that this producer will work well and easily on small, high ash and moisture caking fuels impossible for other producers or for boiler firing, and costing from 2s. to 10s. per ton less, with a general average of 4s. per ton less. The producer is surrounded by an annular boiler, and all the steam required is self-generated. It is said that the full norma yield of ammonia may be obtained without excessive saturation of blast, and consequently in conjunction with gas of an analysis equal to non-recovery practice. The quantity of tar produced is also greatly superior to normal producer gas tar.

Pulverized Coal.

Dr. J. T. Dunn, F.I.C, dealt with "Powdered Fuel and the Smoke Problem," and in the course of his paper said the complaint had been made against powdered fuel firing that, though it may burn coal smokelessly, yet great quantities of fine ash are carried away from it through the shaft, and constitute a nuisance by falling on everything in the neighbourhood. If this complaint were true, it could yet be claimed that such ash from powdered fuel is purely mineral dust, containing no oily, tarry, or sooty matter, and hence is easily and completely removable from anything upon which it may fall. Further, particles of the small dimensions of powdered fuel dust, issuing into the air at a height, in a current which at first is strongly upwards because of its temperature, and afterwards exposed to the winds and diffusion currents of the atmosphere, might (and for the most part probably would) be carried for enormous distances, and be spread over an enormous area, before reaching the ground. It is difficult to learn what proportion of the total ash of the coal is carried out through the stack; but the claim that it anywhere constitutes a nuisance has no foundation in fact. It has been found impossible to get for examination any ash so deposited. In any case, experimental work is being carried on at certain powdered fuel installations to find out whether it is commercially practicable, either by electrical precipitation or by washing, to remove the dust, so that the chimney gases may issue into the atmosphere clean.

Boiler Working and Smoke.

Mr. H. G. Clinch (Chief Smoke Inspector of Halifax) urged, in his paper, that the black smoke from the boiler does not

* Reference to the Wollaston gas producer arrangement will be found on p. 426 of the "Journal" for Nov. 12.—Ed. "G.J."

by any means constitute the whole of the problem. There is still the unavoidable smoke of process work to contend with. The expenditure of 1d. per annum per head of the population on an efficient smoke inspection service throughout industrial Britain would, by reducing fuel costs, and increasing the supply of energy-giving and germ-killing sunlight to the active population, lead to a much-needed decrease in the cost of production. Further, it would be a gilt-edged investment for the nation, in that the export trade would be stimulated, and that, under brighter skies, there would be far less irritation and dissatisfaction in the relations between Capital and Labour. A brighter and more cheerful atmosphere is of the greatest importance in the promotion of good feeling, and is one of the cures for strikes.

Mr. J. T. HODGSON (Lecturer at the Municipal College of Technology, Manchester) drew attention, in a very full paper, to the possibility of securing, by a series of lectures to boiler firemen, an abatement in the smoke emitted from steam plant chimneys.

Mr. W. H. CASMEY, discussing "Furnace and Tank Boiler Design," said the following data contain the necessary information for maintaining a smokeless chimney: Area of furnaces, twice the area of exit from furnace flues; distance from top of bridge to crown plate, one-third diameter of furnace flue in widest part; distance from back end of boiler to brickwork, equal diameter of one furnace flue; bottom flue depth, half diameter of boiler; width of side flues, one-seventh diameter of boiler.

APPLIANCES AT PROVAN.

Mr. ALEXANDER MUNROE (Chairman of the Air Purification Committee of Glasgow) referring to the subject of ash, told the conference that there has been installed at the Provan Gas-Works a Davidson arrester, which takes out 96 p.ct. of the dust that gets to the base of the chimney. A method adopted to economize fuel has also proved effective in preventing smoke. This is the Howden-Ljungstron air preheater.* With this in operation it is found to be practically impossible to make black smoke.

Mr. GIBSON is connected with a colliery company who have burned powdered fuel for ten years. It is very successful, but they undoubtedly get ash, and a large amount of it. If small units were multiplied in Manchester, there would certainly be a very large deposit of ash around the boilers and in the streets of the city.

Mr. MILLS remarked that gas is being burned so satisfactorily in other directions, that it will certainly be the same in connection with steam raising.

Mr. WOLLASTON: Pulverized fuel is only a half-way stage; it is only half gas.

Dr. DUNN said he would be glad if Mr. Gibson would send him samples of the pulverized coal used and of the dust collected.

Mr. CLINCH asked why process smoke should not be passed through thin coke fires, and then sent away as invisible gas.

USE OF ELECTRICITY IN SMOKE ABATEMENT.

Mr. JULIUS FRITH, M.Sc., in the early part of his paper, made reference to a recent Government report in which it was estimated that the industrial power plants of the country consume on the average 5 lbs. of coal per H.P.-hour. In arriving at this average figure, the very large and economical electric power stations which generate 1 H.P.-hour for less than 1 lb. of coal were included. Thus the average private power plant is much worse than the figure named. Indeed, he had met with plants which consume near 10 lbs. of coal per H.P.-hour; and 10 lbs. of coal per H.P.-hour means a thermal efficiency of the order of 2 p.ct.—quite a large proportion of the loss which this involves being accounted for by fuel escaping unburnt up the chimney. The substitution of electric power generated in large and well-managed power stations for the small and generally badly-managed private plant, would not only reduce the total amount of coal burnt to about one-tenth, but each ton of coal would produce only about one-tenth the smoke. Much might be done in the way of supplying heat—say, in the form of hot water—from electric generating stations, which necessarily have large quantities of waste heat (moderate temperature) to dispose of.

Mr. J. W. BEAUCHAMP (Director and Secretary of the British Electrical Development Association), dealing with "The Influence of Electricity on the Domestic Smoke Problem," expressed the opinion that the electrical people, with certain brilliant exceptions, have not so far in any general way shown a grasp of the essentials for making the most of their business in the way that the gas undertakings have done. Upon good service to the consumer success depends even more than upon price; and the work of the inventor and manufacturer, the local business of the installation contractor, and the sales policy of the gas or electricity undertakings, need to be closely co-ordinated if the best results are to be attained. Many gas undertakings provide brilliant examples of this co-ordination, and to day the electrical industry is steadily, and in some places even rapidly, approaching a similar standard. The message to-day of the electrical industry to the householder is based upon a mixture of raw fuel and electricity—the raw fuel to be good coal, coke, or smokeless fuel, consumed in one or two grates or furnaces in each house, and employed for the heavy work of water and room heating; beyond this, to rely upon electricity for short-period heating, cooking of food, lighting, and labour saving by electrically driven machines.

* Reference to the Howden-Ljungstrom air preheater was made on p. 425 of the "JOURNAL" for Nov. 12.—ED. "G.J."

Prof. MILES WALKER, M.A., D.Sc., contributed a paper on "Power from Sources other than Coal," in which he urged that the Smoke Abatement League should take the very greatest interest in the question of the utilization of the tides. Again, it might be a good plan to form an off-shoot from the League, called the Cloud Abatement League, or, perhaps better, the Cloud Control League; for clouds are very valuable, and could be made more so if properly controlled. Physical science has not yet advanced so far that one can clear away the clouds in the sky at will; but he is convinced that future generations will be able to do so. A cloud consists of small particles of water which are so finely divided that they remain suspended in the air. These drops are water, not vapour, so that one does not require great supplies of negative heat to condense the moisture, but only some means of making the particles coalesce. This can already be done on a small scale, and the amount of energy required to bring about the precipitation of a large cloud is small in comparison with the energy that can be obtained from the raindrops as they fall. The control of the sunshine in this way would then bring to consideration the utilization of another source of power—namely, the radiant heat of the sun.

DR. MARGARET FISHENDEN'S VIEWS.

Dr. MARGARET FISHENDEN, during the discussion, said Mr. Goodenough had the courage to admit that gas is dear for continuous heating; for intermittent heating, of course, the case is different. Mr. Nicol told them that in a great many cases where the gas fire is not convenient, coke can be used. Then Mr. Beauchamp pointed out the advantages of electricity, but doubtless he would agree that for continuous heating it is very dear compared with the coal fire. The real point is that there is no one complete solution of the problem of heating houses smokelessly and economically. That is why no expert can give a direct answer to the question; it depends so much on the demand. The matter is not so difficult to decide in the case of the large houses. As to electric heating, though based on sheer cost electricity is dear, it has the advantage that one can place the radiator exactly where it is needed—one can, so to speak, sit on it. Therefore one can do with very much less heat from the electric radiator than when any other method of warming is employed. The problem of smokeless heating is most troublesome when one comes to the small house, where all the needs can be fulfilled—it may be badly—from one coal fire. She is a strong advocate of the use of coke in some instances, and hopes to see low-temperature coke on the market.

COST OF A SMOKY ATMOSPHERE.

Ex Bailie W. B. SMITH, O.B.E., of Glasgow, brought the conference to a close with a popular lecture on this subject, which derived added interest from a first-rate selection of lantern slides. The object he had before him was to try to convince his audience that it costs less to have a pure and clean atmosphere than to have an impure and dirty one; and this he showed in a convincing manner. The death-rate figures for Glasgow, from diseases affected during foggy periods, as compared with a number of other towns in Scotland where the working and other conditions were much the same, but with comparative freedom from fog, spoke eloquently of the need for reform. A small point made was that in lighting streets lined with begrimed buildings it costs more for the gas or electricity than is the case with clean buildings which reflect the light.

In 1909 he addressed the North British Association of Gas Managers, and expressed his conviction that, while gas would be used more than before, the industry must find some means which would give a smokeless fuel to burn in the ordinary grate, instead of the coke they were making. A few years later (in 1912) he saw something he thought was promising in this direction—namely, the Maclaurin process. The Gas Department and the Electricity Department each contributed a little money, the inventor himself put up some more, and at one of the electricity works a producer of this type was erected. When war broke out, the experiments had to be stopped, and then the inventor erected a plant of his own. This was thoroughly tested by the Gas Department, and as the result the Corporation a little over a year ago, after sending the Gas Engineer and the head of the chemical works to see every plant they then knew about, decided by a large majority to put down a five-unit battery. This will give smokeless fuel for the citizens, and very cheap gas to sell to the iron and steel people, and for the electricity boilers. If this proves satisfactory, a scheme is contemplated for firing by this gas the whole of the boilers for generating electricity. Ex-Bailie Smith thinks they are going to do it for less than 1d. per therm for boiler firing. If the coal costs them 20s. a ton, they reckon to sell the smokeless fuel at 28s. 6d. a ton, which is about the figure put on it by the Fuel Research Board, reckoning that smokeless fuel possesses 25 to 30 p.ct. more value in radiant heat into the room than the same weight of coal. There will possibly be from the process an entirely new series of bye-products.

The Staveley Company are now erecting at their Devonshire Works, near Chesterfield, what is considered to be the largest gas engine in the country. It will be used for the generation of electricity by the use of waste gas from the Company's blast furnaces. The engine has been made by Messrs. J. Cockerill & Co., of Liège.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Companies and Electricity Orders.

SIR,—At least some of your readers will be interested to learn that Mr. R. Clarry, M.P., intends to re-introduce at the earliest possible moment his Bill to empower Statutory Gas Companies to promote Electricity Orders. It will be recollected that Mr. Clarry succeeded in getting the Bill through second reading, unopposed, last session. Mr. Clarry informs us that it would help him materially if he were furnished with some evidence as to the number of companies likely to avail themselves of the powers of the Bill, if passed, and has asked us to endeavour to collate this evidence. We should therefore esteem it a favour if any statutory gas company likely to take advantage of the Act, when passed, would notify us to that effect.

Westminster Chambers, R. W. COOPER & SONS.
5, Victoria Street, S.W. 1, Nov. 14, 1924.

Coal Conservation.

SIR,—I shall be glad if you will allow me to reply to your friendly criticisms of my Presidential Address to the Liverpool Engineering Society.

With regard to the estimate of the potential energy of the coal actually utilized in doing useful work, may I point out that this was based on the joint report of Sir Dugald Clerk and Profs. Smithells and Cobb issued in 1919; the major portion of the coal consumed in this country being used for power purposes. The following is an extract from the report:

> Even at the highest brake efficiency of large existing turbines, not more than 20 p.ct. of the total heat of the fuel burned under the station boilers appears as B.H.P. at the turbine, so that at the very first stage of the operation—that is, in supplying power—80 p.ct. of the whole heat of the fuel is necessarily rejected in the thermo-dynamic transformation of heat into work. In the average of existing stations and distributing systems, over 92 p.ct. of the total heat of combustion is thus rejected.

From the above it is evident that the average efficiency in electricity generating stations is less than 8 p.ct.; and there is no reason to believe that power installations generally are more efficient.

Your second point was that I had gone too far in stating that the country's coal resources would last at least twice as long if carbonizing were adopted, instead of the present wasteful methods. This statement depends, of course, entirely on the relative efficiencies of the two processes. There are difficulties in making a proper estimate, as you have readily admitted; and it makes all the difference if 20 p.ct. efficiency is taken for the burning of raw coal, instead of 10 p.ct. Taking your figures for the carbonizing process—and these are probably lower than the average obtained in general practice—and allowing for the heating value of the tar, which you have not taken into account, one ton of coal would produce

74·25 therms in the form of gas,
140·00 ,, ,, ,, of coke,
21·12 ,, ,, ,, of tar.

Again, taking your efficiencies in use for gas and coke, and assuming an efficiency of 25 p.ct. for tar, we have:

Gas	74·25 therms at	50 p.ct.	= 37·12
Coke	140·00 ,,	,, 25 ,,	= 35·00
Tar	21·12 ,,	,, 25 ,,	= 5·28
			77·40 therms at point of consumption.
Coal burned in the raw state at 10 p.ct. efficiency would yield			30·00 ,, ,, ,,
Saving due to adoption of carbonization . .			47·40 therms = 157 p.ct.

If raw coal were credited with an all-round efficiency at the point of use as high as 13 p ct. on the figures given above, the saving in favour of carbonization would even then be about 100 p.ct. R. E. GIBSON.

Nov. 15, 1924.

Mr. Anderson's Paper on "Works Topics."

SIR,—I have to thank you for the favourable notice given to the paper on "Works Topics" recently presented to the North of England Gas Managers' Association, Auxiliary Section. While appreciating the admirable résumé of the paper given in the editorial columns, I beg to draw attention to three points where inaccuracies have crept in. Of these, the first is comparatively unimportant; but the other two are apt to create an entirely wrong impression in the minds of those who read the article.

First, in stating that 12·1 cwt. of coal represents 64 p.ct. of the retort space, it should be understood that this percentage refers to the available space in a new retort, not the actual space after allowing for the scurf. In the latter case, the percentage is considerably over 67 p.ct. —as stated in the paper.

Secondly, the statement is attributed to the writer that a yield of sixty therms is more economical than one of seventy. In this case the statement, correctly reported in the paper, does not specifically mention sixty therms, but simply states that a lower yield often provides a cheaper therm. You will no doubt appreciate the difference here.

The third point, which is obviously a printer's error, gives the greatest variation from the declared calorific value as 11 p.ct., instead of 11 B.Th.U.—which is again a rather serious difference.

G. E. ANDERSON,
Works Superintendent.

The Walker and Wallsend Union Gas Company,
Nov. 15, 1924.

Benzole Recovery.

SIR,—In reference to Mr. Anderson's paper at the recent meeting of the Auxiliary Section of the North of England Gas Managers' Association, I regret that I have not made myself clear in the discussion which followed.

The point I wished to make was that a benzole plant which is being used to equalize the calorific value—that is, to bring the actual calorific value of the town gas nearer the declared value—is in effect recovering thermal value which would not otherwise be paid for. A benzole plant used for this purpose should not therefore be debited with the full cost of the therms recovered as benzole, and the actual financial advantage due to benzole recovery is increased. Such a consideration does not necessarily interfere with the balance-sheet put forward by Mr. Anderson, as the question of equalizing is a local condition, imposed by existing manufacturing plant. G. WEYMAN.

Denton Grange, Carr's Hill,
Gateshead-on-Tyne, Nov. 13, 1924.

Gas Manager's Suit for Libel.—In the course of a letter referring to the libel action brought by him against Mr. F. H. Bigg-Wither, Mr. Harold Higham, Gas Engineer and Manager to the Teignmouth Urban District Council, points out a slight inaccuracy in our report of the proceedings as appearing on p. 441 of last week's issue of the "JOURNAL." His Counsel was there stated to have said that Mr. Higham was previously Assistant Manager at Bradford and Stockport. This should have read "an assistant at Bradford and Stockport."

REGISTER OF PATENTS.

Variable Gear for Prepayment Meters.—No. 222,787.

SMITH, E. W., and SMITH METERS, LTD., both of Kennington Park Road, S.E. 11.

No. 10,610; April 29, 1924.

This invention relates to prepayment gas-meters, and is designed to provide a simple means whereby the mechanism can be easily altered for use with coins of different value; the change being effected by simply reversing one part of the gear or train of wheels between the quantity wheel and the main measuring or valve actuating screw.

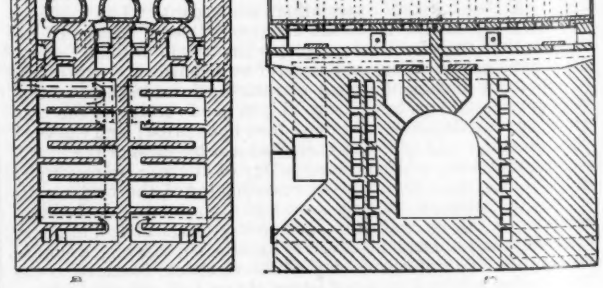
A distinctive feature of the invention is that instead of sliding two toothed wheels along a spindle and setting them in place with packing pieces, there are provided two wheels which it is only necessary to reverse so that they are adapted, one at a time, to mesh with other wheels rigid with a worm wheel actuated by a worm rotated from the usual meter gear. The two wheels are of different size, and are rigid with a boss. They are so constructed that only one of them can be in engagement in either of their two positions. The wheels rigid with the worm wheel are also of different diameters, and the relative number of teeth on all the wheels agree with the relative values of the coins for which the mechanism is designed.

Retort Settings.—No. 222,987.

CUMMINS, F. B., of Manchester.

No. 18,705; July 20, 1923.

This invention relates to horizontal and inclined retort settings, and has for its main object to simplify and reduce the cost thereof, while maintaining a high efficiency and full control of combustion and heating.



Cummins' Retort Setting.

According to the invention supplementary air inlets are provided at the top of the retort chamber for supporting combustion of the burning gases in the retort chamber, the arrangement being such that the burning gases draw-in supplementary air as they travel along their paths.

Running from the front to the rear of the setting beneath the level

of the lowest retorts, parallel waste-gas passages communicate with the main flue; and at the outer side of each waste-gas passage is a producer-gas passage communicating with the main producer-gas conduit. The retort chamber is so divided by partition walls, and the producer-gas passages and secondary-air conduits are provided with outlets so arranged, that the burning gases are first drawn upwards along the side walls of the setting, then pass over and/or under the top retorts, or some of them, and finally down the centre of the setting into the waste-gas passages.

The arrangement of the setting is shown in the accompanying cross and side sectional drawings.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 12.]

Nos. 26,103 to 26,732.

AIRD, K.—"Gas cookers." No. 26,514.
BECK, W.—"Measuring the flow of fluids." No. 26,691.
BONNEFIN, F. H.—"Radiants for gas fires." No. 26,432.
CHANEY, W.—"Distillation of coal." No. 26,718.
CONTE, M —"Gas, &c., meter." No. 26,292.
COOMBS, E. P.—See Beck, W. No. 26,691.
DVORKOVITZ, P.—"Manufacture of hard coke." No. 26,176.
ECCLESHALL, J. T.—"Gas, &c., stoves." No. 26,594.
GLASGOW, A. G.—"Manufacture of water gas." No. 26,196.
GRAHAM, C.—"Gas burners for singeing-machines." No. 26,123.
HANSFORD, J.—"Gas-meters, &c." No. 26,313.
HARTUNG, C. A.—"Gravimetric analyses of gas." No. 26,320.
HENSHILWOOD, A. B.—See Graham, C. No. 26,123.
HUMPHREYS AND GLASGOW, LTD.—"Manufacture of gas." No. 26,197.
MAIN, R. & A., LTD.—See Aird, K. No. 26,514.
NEATH, J.—See Chaney, W. No. 26,718.
SEABROOK, A. H.—"Internal-combustion engines." No. 26,358.
STELFOX, J. C.—See Humphreys and Glasgow, Ltd. No. 26,197.
STOKOE, C. L.—"Safety apparatus for flow of fluids through piping." No. 26,242.

MISCELLANEOUS NEWS.

GREAT YARMOUTH GAS COMPANY.

Centenary Celebrations.

The Directors of the Great Yarmouth Gas Company celebrated the centenary of the undertaking last Wednesday night, by entertaining at a banquet a representative assembly of the leading townsmen and various public bodies. Mr. C. S. ORDE (the Chairman of the Company) presided, and was supported by the Mayor (Mrs. Ethel Leach) and the Deputy Mayor (Alderman R. F. E. Ferrier). Among the visitors was Mr. H. Townsend, who served his apprenticeship to the Yarmouth Company fifty years ago, and has now retired, after an active and successful career in gas management. He travelled from Eastbourne to attend the celebration—a compliment which the Chairman said they greatly appreciated.

The MAYOR proposed "The Great Yarmouth Gas Company."

The CHAIRMAN, in response, said they could look back with much pride upon their history, which had been practically the history of gas undertakings all over the country. From small beginnings, it had become a great industry of public utility; and they might look for developments far transcending anything that had previously taken place. In 1824, the Yarmouth Company was formed by some enterprising men, only twelve years after the first statutory gas company was founded, so that Yarmouth might pride itself on being among the pioneers of the industry. The applications of gas were not one-thousand-and-one, but two-thousand-and-one, apart from the products of carbonization. In 1866 the capital of the gas companies was £20,000,000; to-day it was £165,000,000. Including the non-statutory and private concerns, the total might be put at £200,000,000. In 1882, the number of consumers was something short of 2,000,000; last year it was about 8,000,000. The Yarmouth Company was formed on Nov. 15, 1824, when a contract was entered into with the Paving Commissioners, whose functions corresponded with those of the present-day Town Council, for the supply of gas for public lighting. In 1845 a new Company was formed for carrying on the existing contract with the Commissioners. In 1863 the Company was incorporated by a Special Act of Parliament. Mr. Orde proceeded to give interesting details of the personnel of the Company and the officials, recalling such well-known names as Mr. W. H. Willis and Mr. W. J. Carpenter. He said no better appointment could have been made than that of Mr. P. D. Walmsley, their present Engineer and Manager. After the war he carried out the re-modelling of the whole of the works and the installation of up-to-date machinery. This was no mean achievement, as the manufacture of gas had to go on all the time; but the policy adopted by the Directors had completely justified itself.

Mr. HARRY TOWNSEND, late Managing Director of the Wakefield Gas Company, replying to the toast "The Guests," said that when he became associated with the Yarmouth Company in 1868 he knew nothing about gas; but he found in Mr. Willis, the then Secretary, a very delightful chief who helped him in every way he could. He soon found a knowledge of building construction, engineering, and chemistry was required, and attended classes at the School of Art and Science on the South Quay all the time he was an apprentice. No facilities then existed in the town for learning chemistry, and he ultimately persuaded a master of the navigation to form a chemistry class. To do so, he had to find a minimum of fifteen boys to form the class; and he succeeded, after much trouble, in doing this. They had not an atom of apparatus, but in the following year they managed to pass the elementary stage, and then went on to the advanced and honours stages. This showed the difficulties they laboured under then, as compared with the present day. Next he went to Yorkshire, where he spent forty years. He there found a technical laboratory, and was working in it as a student when between 30 and 40 years old. He wanted to learn gas engineering, but was in the office a mile-and-a-half from the works; and he found the only way he could learn anything was by going to the gas-works before breakfast. He made sketches of the plant, and saw the inside of all the machinery, with the result that in 1876 he became Engineer and Manager of a small gas concern. He had been managing gas-works all over the country ever since. In the Manchester district he met their present Engineer, Mr. Walmsley, and he was sure he would bring the concern to the height of prosperity.

Mr. THOMAS GLOVER, of Norwich, who also replied, said they were celebrating the beginning of a new centenary of service, rather than the past century, and they would commence the second hundred years of the industry, not bemoaning its decay, but in good health and spirits. The industry originated in England, and was developed there at a quicker rate than in any other country, and this country had always maintained the lead. The first gas meter was made in England, and in every part of the world meters were made on the English model. He had visited Toronto, where electricity was sold at 3 cents a unit, and where there was not a gas light to be seen; yet the Toronto Gas Company each noon sent out 1,800,000 c.ft. of gas for cooking. Gas had found other forms of service, and had a great future; and their successors, looking back as they were doing, would say what good men they were who kept things going during the second hundred years.

Judge C. HERBERT-SMITH, of the Yarmouth County Court District, proposed "The Town and Trade of Great Yarmouth;" and Mr. R. G. WESTMACOTT, who replied, regretted that Mr. Walmsley was not returned when he stood for the Town Council a year ago. Not only was he a trained business man, but he had the inestimable advantage of the humorous sporting instinct that every Yorkshireman possessed, and he hoped he would yet see him a member of the Council, where he could render valuable service. He wished the Company every success, which he was sure the Directors and officials merited, and he would not forget the humbler people on which they were so dependent—their employees.

An interesting feature of the occasion was a collection of all the various forms of gas burners which have been in use during the past century.

WELWYN AND HATFIELD GAS ORDER.

The Parliamentary Committee of the Hertfordshire County Council report that the Welwyn, Knebworth, and District Gas Company have applied to the Board of Trade for a Special Order asking for powers for the transfer to them of the undertaking of the Hatfield Gas Company. Up to the present a portion of the Welwyn Garden City has been in the Hatfield Gas Company's area, and part in the Welwyn, Knebworth, and District Gas Company's area; and the Hatfield Gas Company have been supplying their portion of the Welwyn Garden City by purchasing gas in bulk from the Welwyn Company's works.

The County Accountant raised several points on the Draft Order; the principal being (*a*) that the Company should be required to substantiate the large increase in capital, and (*b*) that the renewals fund was being built-up by payments from revenue not exceeding 1 p.ct. of the capital, and that the creation of this additional fund encouraged companies to set aside moneys which would be otherwise available for reduction of price to consumers. There was also the question of the payment of compensation to the Secretary of one of the Companies for loss of office; and the County Accountant thought that an expenditure of this nature should be spread over a number of years. The County Surveyor also raised various points, principally with regard to the position in which the Welwyn Company were placed as compared with the position of the Hatfield Company with regard to roads. The Welwyn Company, whose Order was obtained in 1912, are liable to the somewhat stringent terms which the County Council always endeavour to get inserted in every Gas Order for the protection of their roads; while the Hatfield Company, whose powers were obtained in 1888, are only under slight obligations over and above the usual protection given under the Gas-Works Clauses Consolidation Act, 1845. In the Draft Order it was suggested that the position of the new Company—so far as protection for the county roads is concerned—should remain exactly the same as if there was no amalgamation.

The County Council were advised that in the event of their opposing the Order, with a view to getting the section in the Welwyn Order extended to cover the whole area of the amalgamated Company, it was extremely doubtful whether they would meet with any success. In these circumstances negotiations were opened up with the Company, who offered a modified clause for the protection of the county roads in respect of the Hatfield area, which it appeared advisable to accept. The Company were also able to explain the points raised by the County Accountant to his satisfaction; and in these circumstances the objections which had been lodged with the Board of Trade on behalf of the Hertfordshire County Council pending the result of negotiations were withdrawn.

Gasworkers' Welfare Scheme at Glasgow.—On Nov. 10 a very successful concert was held in the City Hall, Glasgow, the object of which was to provide the nucleus of a fund to establish a welfare scheme embracing every section of the Gas Department's activities in works, distribution, sales, and administration. Bailie Renfrew, Convener of the Gas Committee, presided, and was accompanied by leading members of the Committee and representatives from several provincial gas undertakings. Mr. J. W. M'Lusky, Engineer and General Manager of the Gas Department, briefly outlined the views of the Committee and Management of the scheme.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following further notices regarding applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDERS.

East Grinstead Gas and Water Company.

The Company are to apply to the Board of Trade for an Order under section 10 to extend the limits of supply to include a portion of the parish of Godstone, and for other purposes.

Harrogate Gas Company.

A Special Order is to be sought by the Company to empower them to purchase the undertaking of the Pateley Bridge Gas, Coal, and Coke Company, Ltd., to extend the limits of supply, to make provisions regarding the price to be charged for gas, to raise additional capital, to declare different calorific values for various parts of their limits, and to frame regulations for the supply of gas.

BELFAST GAS METER TESTING STATION.

While the opening of the new Gas-Meter Testing Station at Charlotte Street, Belfast, was marked by no official ceremony, it constitutes a further step in the development of the gas industry in Northern Ireland.

With the rapid growth of the Belfast gas undertaking, the need for a local station became pressing. All the meters for use in Northern Ireland had to be verified either in Dublin or in Manchester or in Glasgow. The firms of gas-meter makers desirous of extending their operations in Belfast were handicapped by having to send all meters away to be tested, and other interested firms found it no disadvantage to make their meters and execute repairs at their cross-channel works situated in or near towns provided with testing stations, rather than in Belfast. The Ministry of Commerce of Northern Ireland took the matter up with the Justices of the City, who in the circumstances are the statutory authority for the setting-up and control of a testing station. The Lord Mayor, Sir William Turner, as Chairman of the Justices, was quick to see the advantages which such a station would bring not only to the City, but also to Northern Ireland as a whole; and he called meetings of the Justices, who very soon brought the matter to a final and satisfactory conclusion. Mr. J. Dunlop Smith, M.Inst.C.E., the Manager and Engineer of the Corporation Gas Department, who has been a powerful advocate of this necessary complement to the gas-works, also assisted materially in having the station set up.

The provision of the new station has already caused two cross-channel firms to open branches in Belfast for the manufacture of new meters from stampings and other raw material obtained from Great Britain. Belfast is one of the greatest producers of gas in the United Kingdom. The present price of gas, when discount is deducted, is 2s. 4d. per 1000 c.ft. The output for the year ended March 31, 1924, was no less than 3567 million c.ft.—an increase of 249 million c.ft. over the figures for the previous year.

CHEMICAL INDUSTRY DINNER.

A dinner arranged under the joint auspices of the Society of Chemical Industry and the Chemical Industry Club was held in the Edward VII. Rooms, Hotel Victoria, London, last Friday. Mr. W. J. U. Woolcock (President of the Society of Chemical Industry) was in the chair.

Sir RICHARD T. GLAZEBROOK, K.C.B., F.R.S., proposed "The Chemical Industry and the Profession of Chemistry," and said there was no doubt whatever that there had been a complete change in the life of the world as the result of the development of scientific methods and their practical applications. Of the sciences which had led to this development and change, chemistry was not the least. Some would claim it to be the greatest.

Mr. D. MILNE WATSON said it was a great privilege to him to reply to the toast submitted by Sir Richard Glazebrook, who among his many honours was the Chief Gas Examiner. He was extremely glad to be present as an industrialist and as a guest of the Society of Chemical Industry, of which he hoped soon to be a member. The conjunction of science and industry exemplified in that dinner showed the progress that had been made in the last few years in bringing scientific chemists and industrialists together. He believed the work of the Society of Chemical Industry was of great importance. They had not forgotten that in 1916 the Association of British Chemical Manufacturers, of which he at present had the honour of being Chairman, was founded jointly by the then President of the Society of Chemical Industry (Dr. Charles Carpenter), the President of the Chemical Society (Mr. Alexander Scott), and the President of the Society of Dyers and Colourists (Dr. Rey). They could understand, therefore, how heartily he welcomed, as a manufacturer, the co-ordination now established between them. Industry to-day was faced with very serious problems all over the world, as a result of the war. There had been a very great extension of chemical plants during the war, but in the impoverished state of the world now it would take many years to get the work of all these plants absorbed, and to correlate them and put them in their proper place. One great hope of the future was that there should be closer working between science and industry—indeed, he believed this was the only hope, if the trade and commerce of the country were to regain their former position.

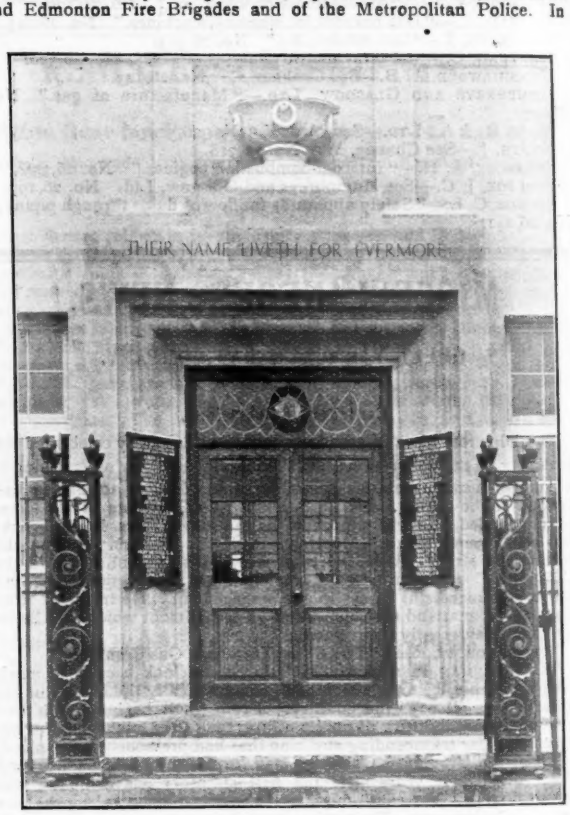
At Burslem last week Joseph Gibson was fined £2 for stealing 4s. 6d. from a prepayment gas meter. The evidence showed that, after he had broken open the meter, he went to the police station and gave himself up.

WAR MEMORIAL UNVEILING AT TOTTENHAM GAS-WORKS.

The Tottenham District Light, Heat, and Power Company's War Memorial was unveiled on the sixth anniversary of the Armistice at 11 a.m. by the Chairman of the Company, Mr. Henry Woodall, M.Inst.C.E., assisted by Sapper H. H. Ludlam, who was the oldest of the Company's employees to serve with His Majesty's Forces overseas during the Great War.

The memorial, which was provided by contributions made by the employees of the Company, consists of a Portland stone entrance to the new club premises which have been erected by the Company on the Recreation Ground, Willoughby Lane. On the Portland stone entrance are two bronze tablets on which are chiselled the names of the Company's employees who lost their lives during the war. The Architects for the memorial were Messrs. William A. Pite, Son, and Fairweather, of 12, Carteret Street, Queen Anne's Gate, Westminster, who were also the Architects for the main club building to which the memorial forms the main entrance.

A guard of honour was formed by 250 of the Company's ex-service men; and in addition there were on parade the Company's Fire Brigade, St. John Ambulance Brigade, a detachment of special constables, including a number of the Company's men who served in the special constabulary during the war, representatives of the Tottenham and Edmonton Fire Brigades and of the Metropolitan Police. In addition there were present about 400 of the Company's employees, together with a large number of visitors, including relatives of the men to whom the memorial is erected.



The War Memorial at Tottenham.

The proceedings commenced at eleven o'clock with the Two Minutes Silence. After the singing of the National Anthem, Sapper Ludlam handed to Mr. Henry Woodall a presentation key on behalf of the employees of the Company, with which the Chairman officially opened the club premises. Wreaths were then placed on the memorial by Sapper Ludlam, on behalf of the ex-service men, Mr. Henry Woodall, on behalf of the Directors, Mr. H. C. Smith, Chief Engineer, Mr. E. J. K. Fussell, Secretary, Mr. G. Warburton, on behalf of the works staff, Mr. J. A. Williams on behalf of the chief office staff, Mr. H. P. Morley, on behalf of the Fire Brigade and Ambulance Corps, and several others.

On unveiling the memorial, Mr. WOODALL said: I much appreciate being asked to share with Sapper H. H. Ludlam the honour of unveiling this memorial to the men connected with our Company who gave their lives in the Great War. The memorial, as you know, has been at the cost of the men; the Directors would have gladly done their share, but they understand the desire of the men, who regard it as their privilege to commemorate their comrades themselves. We are, however, particularly glad that the memorial should form part of the new club premises. The memorial is erected to keep in mind our comrades and the sacrifice they made. Many of us will frequently pass this memorial; but may it never become so familiar that we forget what it stands for. May each sight of it strengthen our resolution to be worthy of those it commemorates, so that when the time comes for us to meet them in the place prepared for brave men, they may

welcome us, because we have tried, however imperfectly, to live for that for which they died—that truth, justice, and honour shall prevail.

In the evening a concert took place in the new club premises, to celebrate the official opening. The programme of the concert was provided by employees of the Company, and was a great success.

THE DOMESTIC COKE FIRE.

As Advocated by Prof. C. V. Boys.

It is often remarked that a good draught is necessary in order to burn coke in an open firegrate. This and many other popular fallacies relating to coke as a domestic fuel are disposed of by Prof. C. V. Boys, F.R.S., who shows, in a pamphlet published by the London Coke Committee, of 84, Horseferry Road, Westminster, S.W. 1, that difficulties experienced in using coke are mainly attributable to the ordinary type of firegrate, and not to the coke itself. The following is extracted from the pamphlet:

I have in the dining-room of my house in the country a fireplace in which I burn common gas coke; and the fire in this is the envy and wonder of all who see it. They say: "What a wonderful draught you must have to get coke to burn like that! Isn't it very difficult to light?" Generally they want to know how it is done. If you wish to burn coke in the domestic fireplace, you should do everything the exact opposite of what is generally believed to be necessary. I do not use broken coke; I do not exclude small coal or dust; and I do not keep the coke dry. It is no advantage that the coke should be wet—quite the reverse—but even so I have no trouble with the fire. Finally, and most important, all the iron from the fireplace has been removed, no fire bars are left, no metal is in contact with the fire, but the fire is built upon a smooth hearth of brick, so that no air can be supplied below the fire. I have had this in use now for ten years, and my excellent housekeeper has thanked her good luck in having in this fire one which is easier to manage than a coal fire, one which can be lighted so as to get properly hot in less time than a coal fire, one which does not go out incontinently if left for several hours—which is a usual experience with one made of caking coal—and one about which there is no metal work to polish. Also there is no chimney sweeping. This fire may be made hot and bright to meet the necessities of the coldest weather, or it may be reduced to so small a size as to be no more than a small heap in one corner, where it will continue for hours at so dull a red heat as not to be visibly alight in full daylight. Anything between these extremes is possible. There is no waste.

When I obtained my house ten years ago I found in the dining-room a well-type fire of a widely-known standard pattern. This had an ash-pit under a cast-iron grid forming the fire bars. There was a raised tile hearth with certain air passages leading to the space below the fire bars; and these, no doubt, supplied a certain amount of air to the fire. I removed the cast-iron grid, filled the ash pit up to a level about 1½ in. below the tile hearth with common brickbats, seeing that their upper surface was fairly smooth and level. Crevices between the brickbats, of course, at once filled with ash, and ceased to be available for air supply, and the air passages in the hearth referred to above were similarly blocked. As is customary in well fires, the firebrick back slopes forward over the fire; and this is a great advantage. The firebrick sides are upright. In my case the width of the front of the fire is 14 in. From this account of the construction of the fireplace it will be seen that there is no mystery of construction.

And now for some consideration of the reason why a fire made as I have described above is so successful. First consider a fire of weeds in the garden. Such a fire is started on the bare ground with some straw and dry sticks, or whatever inflammable material is available. At first weeds that have lain long enough to be withered or fairly dry are put on, and these are followed by weeds or weeds and earth in varying degrees of freshness. Such fuel appears uncompromising, yet it burns slowly and steadily and without any difficulty. Try if you will to burn such material on a grid through which ash and earth may fall. Success is impossible. The secret of the garden fire of weeds is the hot floor of hot ash and earth on which it is resting. Air for combustion can only enter slowly through the sides, but it becomes warm as it passes over the hot floor, and this aids the combustion of the fuel, which is also being slowly warmed and dried by the hot floor. The hot floor is thus added to by the combustion of the drying weeds and separation of hot earth and ash, and the process is maintained. Over a grid the hot material falls through, and is chilled by passing cold air which also chills the grid; and the fire goes out. Similarly in the case of the coke fire on the brick hearth. The hearth becomes covered with a layer of red-hot ash, and the air for combustion, preheated and passing slowly over this and passing slowly through the interstices between large chunks of coke, has time there gradually to combine with the carbon. The major portion of the air, if not all of it, is utilized. With a strong draught much air would pass through these spaces uncombined, and merely act as a cooling agent. If, for instance, when the fire is burning brightly and well, a powerful local draught is made with a pair of bellows, the coke directly blown upon becomes duller, not brighter, but in its continued course the heated and uncombined air may add to the combustion. This will be the case with a big and deep fire; but where the fire is a small one a strong draught simply puts it out.

Laying and lighting a coke fire on a hearth is as simple a process as starting a weed fire in the garden. Some paper and wood is laid as usual—or better, all together—in the middle of the hearth. Small pieces of coke which should, of course, be dry, are laid on either side and over the wood. This dry coke is always available from the residue of the previous day's fire. A fire which has been allowed to die down to a fairly small one at eleven at night will still be very hot at seven the next morning, and often some red-hot coke will be found in the ash. The hot coke is best raked out from the ash before removing the ash with a shovel or scoop, when if placed back at once it may start the fire; or if not hot enough for this, it is only too ready to be lighted again by the wood. No clinker is ever found with the coke.

It is well in building the coke fire to place the large pieces found with unbroken coke on the fire after it has been lighted and become hot as described, and over these to shovel smaller coke. The smallest coke and dust is best dealt with in very cold weather, when the deepest fire would naturally be made. This may then be shovelled gently on to the top, when it will all become red hot, and, occasionally trickling through and resting on the coke below, will gradually burn away. On no account should anyone be allowed to spoil the fire in this stage with the homely poker. The unskilled use of the poker will merely mean that all the small will settle through on to the hearth, and become mixed with the ash, and a large proportion will be wasted.

I have said that the coke fire will get properly hot in less time than a coal fire. It will not start to burn so quickly; but coal, until the gas has been distilled out of it, cannot become red hot and make the real hot background of a hot fire. Plenty of flame and smoke is available very soon from the process of distillation, but this takes time for completion, and the red-hot fire is only possible later on. Coke, on the other hand, especially if already hot and dry, is made red hot by the application of but little heat, and the coke over and round the wood is very quickly red hot. It is necessary when the coke fire has been burning from four to six hours, according to its size, to insert a poker as low down as possible, and lift the coke in a few places, so as to allow the red-hot ash, which in time would fill the airways and spoil the fire, to settle down on to the hearth. This may have to be done twice in the day; and obviously small coke is only put on after such clearing of the fire, and not before.

A coke fire made on a hearth as described obtains all the air it needs by convection; the new air coming in low down in front, passing over the hearth and through the spaces between the pieces of coke, and up out at the back. According to the size and depth of the fire, so is its temperature, and so in a much higher degree is its heating power. A large fire piled fairly high becomes very hot, but not hot enough to fuse the ash and make clinker; and large pale flames play upon the sloping firebrick backing, making it also very hot. As I have no fire-bars in front, I often use one or two big pieces of coke as buttresses lying upon the raised hearth so as to support the fire and prevent its falling outwards. These become red hot at the back, and slowly burn, and they can be pushed back from time to time in the course of the day.

STOCKTON-ON-TEES CORPORATION GAS ORDER.

Mr. H. C. HONEY (Director of Gas Administration at the Board of Trade) last Thursday inquired, at the offices of the Board, into an application by the Stockton-on-Tees Corporation for a Special Order under section 10 of the Gas Regulation Act. The purpose of the Order is to authorize the Stockton Corporation to utilize additional lands for the manufacture and storage of gas; to acquire the undertaking of the Yarm Gas Company, Ltd.; and to extend the area of supply to include various townships and parishes.

Mr. H. GIBBON PRITCHARD (Messrs. Sharpe, Pritchard, & Co., Parliamentary Agents) represented the Corporation; and there were also present Alderman John M'Naughton (Chairman of the Gas Committee), Mr. W. W. Atley (Corporation Gas Engineer), Mr. Thomas Downey (Town Clerk), and Mr. T. H. Salmon (Borough Accountant). There was opposition by the Thornaby-on-Tees Corporation (whose area is supplied by Stockton) with regard to the application of revenue, and they asked to be entitled to inspect the gas accounts of the Stockton Corporation. They were represented by Mr. C. E. BAKER (Messrs. Baker and Co., Parliamentary Agents). The Stokesley Rural District Council, in whose area Yarm is situated, were represented by Mr. W. C. FAWCETT (Clerk to the Council), and asked that the works at Yarm, which were to be acquired by the Stockton Corporation, should not be used for the manufacture of gas, owing to the nuisance which, it was alleged, would result. Agreement was reached in this connection, however, before the end of the inquiry, on the lines that the works should not be used for manufacturing purposes except in cases of emergency. Opposition by the London and North Eastern Railway Company was not proceeded with, it having been agreed to insert a protective clause. Clauses, of a common nature, for the protection of the County Councils of Durham and the North Riding of Yorkshire, in respect of roads and bridges, were also inserted.

Mr. H. GIBBON PRITCHARD said the new area, as set out in the original Order, was modified, in consequence of an agreement which had been reached for the Corporation to promote a Bill in Parliament for the purchase of the Haverton Hill Gas Company, Ltd. A further modification arose out of the decision of the Stockton Corporation to give up their existing powers to supply in part of the parish of Stainton (the other part of which is supplied by the Middlesbrough Corporation). Having relinquished these powers, it was found uneconomical to supply two townships between Stockton and Stainton, and consequently they were deleted from the Order. The Thornaby Corporation objected to the proposal to create a reserve fund, and a fund for working capital out of surplus profits; and they objected to the application of surplus profits to relief of rates.

Mr. BAKER said he objected to the Stockton Corporation applying revenue to capital purposes.

Mr. PRITCHARD pointed out that the Corporation had offered to limit the surplus which could go to the rates in any year to £2000.

Mr. BAKER replied that they had not offered to insert a clause prohibiting the application of revenue to capital purposes.

Mr. PRITCHARD said there was a clause indicating how revenue was to be applied.

The clauses in the Order dealing with this matter provide that the revenue of the gas undertaking shall be carried to the borough fund, and all payments and expenses be paid out of this fund. Accounts are to be kept so as to indicate receipts and expenses, such expenses being divided to show the amounts expended in respect of (*a*) working and establishment expenses and cost of maintenance, (*b*) interest on borrowed money, (*c*) instalments or sinking-fund payments in respect of money borrowed, and (*d*) a reserve fund, not to exceed in any one financial year a sum equivalent to 0·5 p.ct. of the total capital expenditure, and the total of the fund not to exceed one-fifth of the aggregate capital expenditure. Also, if there is a surplus, the Corporation can set aside in any year a sum not exceeding 2 p.ct. of the amount of

the working expenses of the undertaking in the immediately preceding year for the purpose of providing a fund for working capital—the total fund not to exceed one-fifth of the average amount of the working expenses in each of the three years immediately preceding the date at which the amount of the fund was calculated. A rider is added to the effect that, whenever the money received on account of revenue in any financial year exceeds, by more than £2000, the amount expended or set aside for the purposes mentioned, the price of gas in the following year shall be reduced to an extent equivalent to the amount of the excess, provided that if, owing to an increase in the estimated expenditure or a reduction in estimated revenue for the next succeeding year, the excess or part of it shall be required in order that the revenue may not be less than the amount to be expended, the reduction in price need be only such as will reduce the revenue by the amount of the balance of such excess.

Mr. PRITCHARD said Mr. Baker could not point to any provision there which allowed the Corporation to expend revenue on capital work.

Mr. HONEY remarked that the point was that there was no specific prohibition, and that the clause merely refrained from authorizing the Corporation to do this. Then the rider went further.

Mr. PRITCHARD said that was only a limitation of surplus profits.

Mr. BAKER asked that there should be inserted a specific prohibition from applying revenue for capital purposes, which the Corporation had been doing for years past, and were doing at the moment.

Mr. PRITCHARD could not agree, because he believed it would be entirely contrary to any precedent. It was not a legal expenditure. The Corporation admitted they had done it in the past, to the very great advantage of Thornaby; but he could not agree to the insertion of any further limitation on the expenditure of capital out of revenue. He could not see the reason for the opposition of the Stokesley Rural District Council to the Order, because it seemed that Yarm must benefit.

Mr. FAWCETT said he was willing to be supplied by the Corporation, but objected to their manufacturing at Yarm, though not to storing gas.

Mr. PRITCHARD replied that the Corporation wished to retain power to manufacture in Yarm, because the town was a considerable distance from Stockton, and it was just possible that there might be a breakdown, which would prevent Yarm obtaining a supply from Stockton. The Corporation would only manufacture at Yarm in that event.

Mr. FAWCETT said he would have no objection to the manufacture of gas in Yarm, if it were done on the vertical retort system.

Mr. PRITCHARD said they could not do that.

Mr. FAWCETT replied that, if they could not do so, they would create a nuisance. He also pointed out that the Corporation had supplied within the limits of Yarm for the last forty years without a breakdown.

Mr. *Arthur Valon* (Consulting Engineer to the Stockton Corporation Gas Department), in evidence, said that there was no limitation at present upon the Corporation applying surplus profits to relief of rates.

Mr. PRITCHARD stated definitely that the Corporation were entitled to do so under their Acts.

Witness referred to a statement by the Thornaby Corporation that £56,893 had been put to the borough fund during the period from 1906 to 1923. This was equivalent to about 1½d. per 1000 c.ft. on the present sale of gas. The Corporation proposed to limit the amount to £2000 per annum, which was equivalent to 1d. per 1000 c.ft. The Thornaby Corporation had suggested that they would provide £400 of the £2000; but supposing they did, the amount per 1000 c.ft. consumed would be very small. The average amount per consumer yearly would be about 1s. 6d. Consumers in Thornaby were getting gas more cheaply than if it were supplied by the Thornaby Corporation or a company from a separate works. The capital for the Stockton undertaking was raised at a low price on the security of the rates—*i.e.*, the security provided by the Stockton ratepayer—and it did not seem unreasonable that the Stockton ratepayer should get something in return for having provided the security which enabled the capital to be raised cheaply. There was an agreement by which the price in Thornaby should be the same as in Stockton. The present price was 7·2d. per therm, less a discount of 10 p.ct.; the net price being 6·66d. per therm, equivalent to 2s. 9·3d. per 1000 c.ft. In 1914 the price was 2s. 4d. per 1000 c.ft., so that the increase since was extremely low. No Increase of Charges Order had been obtained; the Corporation having decided to run the risk of retaining their maximum price, which was 5s. per 1000 c.ft. This risk was a real one. Therefore, though Thornaby was taking no risk, they were in a favourable position. A statement was also made that £54,200 had been used between 1907 and 1923 for other than normal revenue purposes. He had found that most of this was spent on meters and stoves. In his experience, the Ministry of Health did not altogether approve of borrowing for those items; and if money was spent year by year in this way, it made no difference to the price of gas whether the Corporation paid out of revenue or borrowed and paid by sinking fund. There was also a certain amount spent on a benzole plant, built during the war. It seemed reasonable to pay for this out of revenue. Some of the items included were for superseded capital works, which it was only proper should be charged to revenue. As to the creation of a reserve fund, company undertakings had powers in this direction; and a number of local authorities also had the power. In his opinion it was desirable, particularly where there was restriction as to the application of revenue, as in this case. The maximum annual sum to be so allocated was only 0·5 p.ct. of the total capital expenditure, whereas in the case of a company 1 p.ct. was allowed. The rate at which the fund for working capital was to be accumulated—namely, 2 p.ct. of the working expenses annually—he regarded as being too slow. They must have working capital, and if they did not provide it in this way they would have to borrow and pay interest, so that it was cheaper to have a fund out of revenue. He did not know of a case where one local authority, in the limits of supply to another, had power to inspect the accounts and make representations as to whether the expenditure was properly put to capital or revenue. Such a power would certainly give rise to friction.

Mr. PRITCHARD said he would be surprised if the Thornaby Corporation could point to precedents for it.

Witness said it was ludicrous to propose that they should put up vertical retorts in such a small works as at Yarm. The Yarm works were about 5 miles from Stockton, and a breakdown in the main was possible.

Mr. BAKER, in cross-examination, pointed out that for over sixty years the Corporation had carried on the Stockton undertaking without a fund for working capital.

Witness replied that now they were limiting the purposes to which revenue could be applied, they must provide for it.

Reference was then made to the fact that the Middlesbrough Corporation supplied gas at a price lower than that at Stockton, due to taking a large proportion of coke-oven gas.

Mr. BAKER suggested that if Stockton had supplied a proportion of coke-oven gas their price could have been reduced.

Witness replied that Middlesbrough was bigger.

Mr. BAKER said that coke-oven gas was offered to Middlesbrough at 4d. per 1000 c.ft., and to Thornaby at 6d., because the latter did not require so large a quantity as Middlesbrough. Advantage had not been taken of this offer.

Mr. PRITCHARD said that Stockton could not, because they had not the powers.

Mr. HONEY, when questions were asked as to the prices charged in 1919 and 1921, inquired whether anything turned on this, in view of the agreement to charge the same price in Thornaby as in Stockton.

Mr. BAKER said he wanted to emphasize that Thornaby had not been fairly treated, and that the agreement did not prevent the Stockton Corporation charging what price they liked and taking money from Thornaby to benefit Stockton. Large sums were taken—£10,000 in 1920—for the relief of Stockton rates, and Thornaby contributed.

Witness said that in the third quarter of 1920 the net price was 4s. 6d. per 1000 c.ft., and in the fourth quarter 4s. 2·3d., the reduction being entirely due to the high prices obtained for export coke. The Corporation would have been perfectly justified in keeping the profit so made, instead of reducing the price of gas; and if they had done so, it was probable that they would not have needed to have increased it so much later. He agreed that in 1921 the price was raised to 4s. 11d., but costs were high, and there was a coal strike in that year. He did not know of any provisions by which the Corporation were definitely prohibited from expending revenue for capital purposes. If done carefully, capital expended out of revenue, within reasonable limits, was an advantage to the consumer. He would not agree that there was no real check on the Corporation in this respect, in view of the clause stating the objects to which revenue could be applied.

Cross-examined by Mr. FAWCETT with regard to the Yarm works, Mr. Valon said he should think the works created a nuisance when gas was manufactured there, and agreed that there was a possibility of nuisance if manufacture were resumed. The possibilities of a breakdown of the main between Stockton and Yarm were not very big, but there was only the one main. To Mr. Fawcett's remark that he wanted to limit as much as possible the manufacture of gas at Yarm, Mr. Valon replied that the matter could rest safely on the commercial interests of the Stockton undertaking.

Replying to Mr. PRITCHARD, in re-examination, Mr. Valon said that, though the Thornaby consumers cost more to supply than the Stockton consumers, they received gas at the same price. The number of consumers in Thornaby was less, and the consumption per mile of main was less.

Mr. HONEY, having ascertained that the capacity of the Yarm works was roughly 5 million c.ft. per annum, and that Stockton were supplying about 6 millions a year there, said he could not see what use they would be as a stand-by. Referring to the fund for working capital, he said there was not much difference between that proposal and the raising of the money by a short-period loan.

Witness said it would make no difference, except to save the trouble of borrowing and repaying the money.

Mr. BAKER then addressed Mr. Honey, and emphasized the objections raised by the Thornaby Corporation. There were very few cases, he said, in which a municipal undertaking supplied an outside authority so large, and so close to the supplying authority as Thornaby was to Stockton. The provisions in other Acts and Orders relating to outside areas ought to be looked into closely when they were to be applied to a community to which these special circumstances applied. Thornaby, as consumers of the gas supplied by Stockton, submitted that they should have some power to intervene and to see that the undertaking was carried on reasonably.

Asked by Mr. PRITCHARD what proposal he had to make with regard to the application of revenue in the present case,

Mr. BAKER suggested it should be stated definitely that the Corporation should apply all money received in respect of the undertaking to the specific purposes laid down. The clause at present in the Order merely stated that the Corporation should keep their accounts so as to show receipts and payments separately, such payments and expenses being divided so as to indicate the amounts expended or set aside in respect of each of the purposes mentioned.

Mr. PRITCHARD said he had taken the most recent form adopted by the Local Legislation Committee of the House of Commons. The clause relating to paying receipts into, and taking expenses out of, the borough fund was part of the same matter. He did not, however, think he would object to Mr. Baker's suggested alteration.

Mr. HONEY remarked that the clause did not seem to be entirely satisfactory as it stood.

Mr. PRITCHARD stated that he was willing to make it an "application of revenue" clause, and to have it re-drafted in order to make it clear that the Corporation should apply their revenue to the purposes mentioned.

Mr. HONEY said he appreciated the difficulties of re-drafting. If that form had been deliberately adopted by the Local Legislation Committee, he would hesitate to alter it, unless they could get something which was obviously more satisfactory.

Mr. BAKER said that for years Thornaby had paid a higher price than Stockton. It created a considerable amount of feeling, and in 1913 they had made up their minds to separate from Stockton and

have their own gas undertaking. A Bill was actually lodged for the purpose, but an agreement was reached between the two Corporations in 1913, and continued in 1923, by which Thornaby consumers were to be treated in the same way as Stockton consumers. As to the application of revenue for capital purposes, it was desirable, especially having regard to Mr. Valon's suggestion that the Corporation, although they had no statutory power, would be well advised in doing this, that somebody should have power to go through the accounts and to appeal, if necessary, against large payments, which were illegal. Also, the Corporation should not have power to apply revenue for working capital as well as to borrow for that purpose.

Councillor *W. Harris* (Thornaby) expressed the attitude in Thornaby with regard to this matter. Up to 1920 well over £200,000 had been paid to the relief of rates in Stockton; and he contended that Thornaby, having consumed one-fifth of the gas supplied, had contributed £40,000 to this.

Mr. PRITCHARD remarked that this covered a period of 63 years.

Witness (continuing) said that the undertaking had paid for itself, and had never been a drag on the ratepayers of Stockton. He also emphasized that an unusual proportion of the Thornaby consumers were slot consumers—a larger proportion than in Stockton. The charge for slot-meter gas was higher than gas supplied otherwise, and therefore the average amount paid by the Thornaby consumer was higher than the average paid by the Stockton consumer. If any proportion of the amounts paid by Thornaby consumers for gas were devoted to purposes other than those of the gas undertaking, those consumers were not being reasonably treated, as compared with the Stockton consumers. He was concerned with the principle. He urged that provision should be made so that the clauses in the Order should not operate in increasing the price of gas in Thornaby, which, apparently, was threatened.

Mr. PRITCHARD referred to a suggestion by Mr. Baker that the Stockton Corporation had no right to pay revenue into the borough fund. He held that they had had the right to pay it into the borough fund, and that, once it was there, nobody questioned that it could be applied in the way in which the Municipal Corporations Act said it should be applied.

Borrowing powers authorized by the Order are £3000 for the purchase of the Yarm undertaking, repayable in 35 years, and the necessary sum for the costs of the Order, repayable in five years. Power is given to borrow for other purposes, with the consent of the Minister of Health. New clauses include one authorizing a differential price of 0·8d. per therm in the area outside the boroughs of Stockton and Thornaby and the parish of Yarm. Another gives the Corporation five years in which to lay the necessary mains for supplying the added areas, after which any local authority, company, or person may apply for powers of supply and the repeal of the Corporation's powers.

Reduction in Price at Dalkeith.—The Dalkeith Gas Company announce a reduction in the price of gas from 4s. 7d. to 4s. 2d. per 1000 c.ft. as from the date of the meter readings now being taken.

PROFITED BY WEMBLEY.

Gas Industry's Satisfaction.

Was Wembley worth it? The answer of industrial exhibitors may or may not be unanimous, but one at least of the very largest enterprises represented in the Palace of Industry is certain that its money was well spent. The gas industry is well satisfied. Sinking their individuality in one co-operative display, the gas supply undertakings of the Empire, together with the leading manufacturers of gas appliances, united to produce what was admittedly among the most attractive of all the industrial exhibits.

For many years past the gas industry has been steadily increasing the number of its consumers; gas sales have rapidly gone up; gas has become more and more popular as a domestic fuel, and is constantly being applied to many new purposes in industry. It was in any case certain that 1924 would again prove a record year for the industry; but those who control it are convinced that their Wembley venture has made this progress doubly sure, not only now, but in the years to come. Millions of visitors from all parts of the Kingdom have passed through the Gas Exhibit, few without learning something; and because the industry was wise enough to back-up its Wembley display by an attractive advertising campaign, it is certain that the good seed sown will bear fruit now and in the future.

The immediate stimulus to gas business is revealed by the remarkable rush for fires which is being experienced at the beginning of the winter season. One London Gas Company alone has recently been sending out from its stores between 2000 and 3000 new gas fires a week. A boom like this is significant following the industry's part at the British Empire Exhibition. It is no doubt gratifying to the industry; but it may also be viewed with satisfaction by the man in the street who has no special interest in the business, for it means fewer smoke-producing fires, and more rapid progress in the urgent campaign against the smoke and fogs which make our winters twice as sunless, sad, and gloomy as they ought to be.

Buxton Gas Undertaking.—The annual accounts of the Buxton gas undertaking show that, due chiefly to a reduction in the price of gas, the profits last year were £8007, as against £9842 in the previous year. The net profit amounted to £5778, and the balance of the reserve and renewals fund was £4068.

Uxbridge, &c., Gas Company Capital Issue.—Announcement is made elsewhere in to-day's "JOURNAL" of a new issue by Messrs. A. & W. Richards, on behalf of the Directors of the Uxbridge, Maidenhead, Wycombe, and District Gas Company, of £60,000 of debenture, preference, and ordinary capital; the money being required to enable the Company to extend the works, mains, and plant, in order to meet the growing demand for gas. Tenders have to be sent to the firm, at No. 37, Walbrook, E.C., by 11 o'clock on Thursday, Nov. 27.

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"READ THE PRESSURE BY THE POINTER."

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No glasses to break and nothing to clean.

Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

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MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

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TRADE NOTES.

The Underfeed Stoker Company, Ltd.

The firm have recently had many important orders for their stokers, &c., both for England and abroad. India, Japan, and Holland are among the countries who have realized the advantages of the firm's travelling-grate stokers.

British Boilers for Copenhagen.

The Municipality of Copenhagen have placed another large order for water-tube boilers with the Vickers-Spearing Boiler Company, of Barrow-in-Furness. This is the second contract the Municipality have recently placed with this Company.

Concrete-Lined Iron Pipes.

The latest publication of the Stanton Ironworks Company, Ltd., of Nottingham, concerns the Stanton pipe which is lined centrifugally with concrete. As is usual with the literature of this well-known firm, the pamphlet is excellently printed and contains a good deal of useful information. It will be of interest to all gas engineers.

Sulphate of Ammonia Drying Machines.

The Chemical Engineering and Wilton's Patent Furnace Company, Ltd., No. 76, Victoria Street, S.W. 1, have published a detail list of spare parts for their sulphate-drying machines. This has been sent to every works at which a Wilton plant is installed; and the firm have been complimented on the production of a list which enables a works to order by number any spare part for all machines, which have been standardized. No less than seventy plants have been installed by the firm.

CONTRACTS OPEN.

Fireclay and Silica Material.

Tenders are invited by the Gas Committee of the Manchester Corporation for the supply of certain fireclay and silica goods. [See advertisement on p. 530.]

Sulphate of Ammonia and Tar Distillation Plants.

The Gas Committee of the County Borough of Stoke-on-Trent are inviting tenders for the erection complete of sulphate of ammonia plant and tar distillation plant. [See advertisement on p. 530.]

Pipes and Specials.

In connection with their St. Marychurch gas undertaking, the Gas Committee of the Torquay Town Council are inviting tenders for the supply of 8-in. steel or wrought-iron main with specials. [See advertisement on p. 530.]

Cooling Tower and Boiler House, &c.

In connection with their Bradford Road Gas-Works, the Manchester Corporation Gas Department are prepared to receive tenders for a cooling tower and the construction and erection of a boiler house and pump house extension. [See advertisement on p. 530.]

Retort House and Equipment and Electrical Generating Set.

The Dewsbury Corporation Gas Department are asking for tenders for the demolition of an existing retort house, the erection of a new retort house, and the supply of coal handling and conveying plant, charging and discharging machines, coke handling and quenching plant, electrical generating sets, &c. [See advertisement on p. 530.]

EXTENSIONS.

New Retorts for Dewsbury.

The Dewsbury Town Council, sitting in committee last week, approved a Gas Committee proposal for the installation of seven new beds of horizontal retorts, at a cost of £30,000.

Inquiry at Hebden Bridge.

Dr. A. W. Brightmore, an Inspector of the Ministry of Health, conducted an inquiry at Hebden Bridge into the application of the Hebden Bridge and Mytholmroyd Gas Board for power to borrow £9600 for new coal-handling plant and vertical retorts. There was no opposition. The Clerk (Mr. S. Ogden) said the Board's debt last March was £115,995, of which nearly £60,000 had been repaid or placed to redemption and sinking-fund account. The total make of gas last year was 114,571,000 c.ft.—an increase of 10,000,000 c.ft. on that of the previous year. Mr. A. Sutcliffe (Chairman of the Board) said the new plant was essential to meet the steadily increasing demands of the district. Mr. T. H. Nield (the Engineer and General Manager) endorsed the facts stated.

Retford Gas-Works Extensions.

At a meeting last Thursday, the Retford Corporation determined to carry out extensions to the gas-works. This will entail the remodelling of the works, for which it is hoped that a Government grant will be obtained. The Gas Manager (Mr. J. R. Bradshaw), the adoption of whose report was moved by Alderman Thornton, had submitted three schemes for improving the works so as to enable the undertaking to meet the increasing demands for gas, these being (1) the installation of carburetted water gas plant, (2) complete gasification plant, and (3) horizontal retorts. Having regard to the advantages and disadvantages of the three schemes, he recommended that horizontal retorts should be installed with mechanical stoking, for which a new retort house must be established—the new retorts to be got to work before dismantling the old benches. This building was to be erected upon a new site adjoining the present works at Raglan Road. It would contain a bench of five settings of eight through retorts, complete with electrically-driven stoking machinery and coal elevating

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and conveying machinery, together with storage hoppers. A chimney stack 80 ft. in height would also be needed.

The adoption of the Engineer's report was seconded by Ald. Williamson, who pointed out that the estimated cost of the projected works was between £36,000 and £40,000; the present assets of the Corporation being approximately £100,000. The consumption of gas in the town was increasing greatly, necessitating urgently the installation of new plant. It was contemplated that they would be able to obtain from the Government a grant from the unemployment fund, which would represent 25 p.ct. of the cost of the new works. As showing the popularity of gas for domestic purposes, Ald. Williamson mentioned that there were now 919 cookers and fires on hire in the town, in addition to many privately-owned appliances; there having been an increase in these of 400 since 1923. This showed the necessity of taking steps at once to meet the increased demand.

NORTH-EAST COAST COAL TRADE.

From our own Correspondent.

The past week has again been disappointing, and there is little to report except lack of trade. The increased demand which it was hoped would be forthcoming, and which, from the amount of inquiry recently, seemed imminent in the previous week, has not developed, and all classes of coal are still offering in abundance at the same low levels. The trouble is that buyers continue to think that prices have further to fall, and business for all periods matures extremely slowly. It is practically impossible to forecast the course of markets; but at present collieries refuse to contemplate any further falls in price, and in many cases even quote higher prices for next year's contracts than for business over the remainder of this year. The view they take is that, in addition to prices being already as low as they can be in relation to costs, so many would-be buyers have been holding off for so long, that any increased demand with improving trade must bring something of a rush to cover requirements. Of course there is the increasing production of Germany to reckon with; but, even so, it is felt that our present export trade need not be by any means the best we can hope for.

Good class gas coals have remained steady, and are moderately well booked for early dates. Wear specials quote 22s. to 22s. 6d., and best qualities about 21s. Seconds have been weak and plentifully offered at 17s. to 18s. A feature has been the continued weakness of unscreened coking, though Durham coking smalls have been firm.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Many gas undertakings are appreciably extending the scope of their operations in connection with domestic heating supplies. This is held responsible in part for the slackness of the demand for household coals, but far more influential reasons are, of course, the abnormally large stocks in private cellars and store houses and the comparatively mild weather. There appears to be a marked growth in the domestic consumption of gas, notwithstanding the keen competition of electricity.

The industrial demand for gas increases only slowly; but the signs are more encouraging, particularly in connection with the heat treatment of metals. Gas works continue to take regular deliveries of coal. There is so little doing outside contract supplies that spot lot prices have no significance. To accept them as an index of real values would be distorting the position. It is sufficiently obvious, however, that the absorptive capacity of the market has not been equal to the supply; and until present congestion has been relieved, pits which depend upon current demand will have to moderate their output. Slacks and smalls can be obtained at very low prices. On the strength of the improvement which the pig iron market has evinced lately, coke suppliers are quoting higher prices. Beyond defining values more clearly, the effect is almost negligible.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals in the open market in Yorkshire and Lancashire are freely offered; but consumers are finding it difficult in many instances to take up their contract obligations.

There is a more optimistic tone as to deliveries of industrial coal, but whether this is a matter of anticipation rather than a general increase in the volume of trade is one of conjecture. Certainly some areas, Sheffield among them, show signs of revival, as is also the case with certain areas in Lancashire. The woollen trade, however, continues quiet, and it is expected that it will be some months before there is a tendency towards a gradually increased consumption.

The slump in export fuel continues; the inquiries from abroad coming through very slowly, and even then not much volume of business is involved. The larger steam coals maintain their price; but the commoner fuels and the smaller-sized coals have been discounted as compared with last week. Probably in view of the approach of the Christmas Holidays, furnace coke is rather stronger.

There does not appear to be any alteration in the demand for household coals, and even the better grades are not in the same request as they were at this time last year. Secondary qualities are still easy.

Prices at Hull at the week-end were: Bunkers—Yorkshire, Derby, and Notts large screened steam, f.o.t. Humber ports, 17s. 6d. to 20s. 6d. per ton. Cargo for export, f.o.b. usual shipping ports—Best Yorkshire hards, 23s.; Derby best hards, 23s 6d. to 25s. 6d.; West Yorkshire Hartleys, 17s. 6d. to 22s. 6d.; South Yorkshire washed doubles, 19s. 3d. to 19s. 6d.; ditto washed singles, 18s. 3d. to 18s. 6d.; dry doubles, 15s. to 16s. 6d.; South Yorkshire washed smalls, 14s. 3d. to 14s. 6d.; Derby slack, 1 in., 9s.; South Yorkshire rough slack, 9s. 3d. to 10s.; gas coke, 30s. to 36s.; foundry furnace coke, 20s. 6d. to 21s.; washed smithy peas, 21s. 6d. to 25s.; washed steam thirds, 18s. 6d.; Yorkshire washed trebles, 21s. to 23s. 6d.

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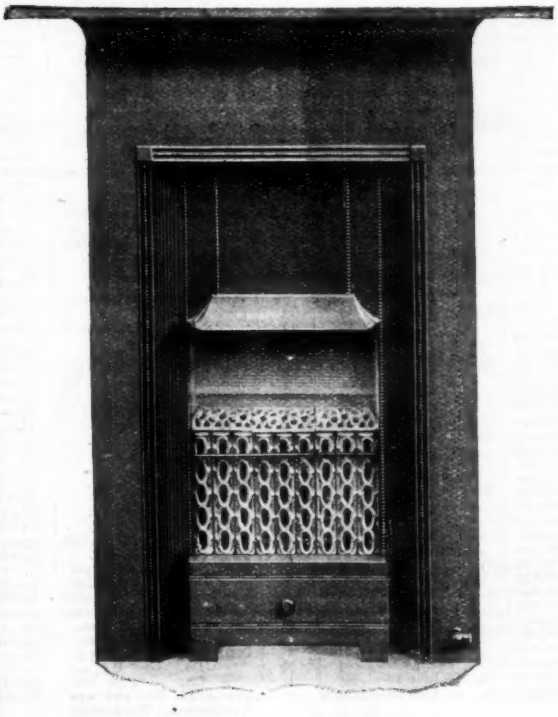

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STOCK MARKET REPORT.

THE tone of the Stock Markets was quieter last week, and, although there was no diminution of confidence, there was a slight reaction in prices. This, after the first burst of enthusiasm following the result of the General Election, was to be expected. It is obvious that any permanent improvement in the value of securities can only be brought about by satisfactory results; and these will necessitate many months of hard work not only by the Government, but also on the part of the Commercial and Industrial interests.

Gilt-edged investments still continue to be well supported, and it remains to be seen whether the trade results will justify the transfer of funds from the low-yielding stocks to the more speculative but higher-yielding issues. The 5 p.ct. War Loan was steady at 101½. Conversion Three-and-a-half p.ct. closed easier at 97 15/16. Sudan new "Fours" hardened to 1¾ premium. Home Rails were firm; and Southern Railway new preference was dealt in at 1½ premium. There were inquiries for Russian securities, and prices rose in some instances. Oil shares were weak; but there was some improvement in Rubber and Tea shares.

In spite of the many changes in the quotations of Gas stocks, inquiries on the market elicited the fact that there was very little stock on offer. For instance, a broker on receiving an order and given the names of ten of the more important Suburban and Provincial companies, could find stock available in respect of one of the companies only. As will be seen by the Table, prices remain firm with, in the majority of cases, an upward tendency. Brentford "A" and "B" stocks have improved again, and now stand at 112-117.

The following transactions were recorded during the week:

On **Monday**, Bournemouth "B" 12⅝, Brentford "A" 113½, 114½, Continental Union 39½, 7 p.ct. preference 92, 92½, European 8⅛, 8⅜, 8 15/16, Gas Light and Coke, 95½, 96, 96¼, 96⅜, 96 7/16, 96½, 4 p.ct. preference 80, 3 p.ct. debenture 63, Imperial Continental 177, 178, 178⅛, 179, Primitiva 8s. 9d., San Paulo 5 p.ct. debentures 43, South Metropolitan 99⅜, 100, 100⅞, 3 p.ct. debenture 60¼, Wandsworth "B" 116½, Wimbledon 112⅞. Supplementary prices, Reading 5 p.ct. 81⅛.

On **Tuesday**, Alliance and Dublin 65 5/16, 65½, 4 p.ct. debenture 65, Bournemouth 3 p.ct. debenture 58, 59, British 117¼, Commercial 4 p.ct. 96, 3½ p.ct. 96, Continental Union 38¼, 39½, 7 p.ct. preference 92½, 92⅝, European 8⅜, Gas Light and Coke 95⅝, 95⅞, 96, 96⅛, 96¼, 3½ p.ct. maximum 63¾, 4 p.ct. preference 81, Hornsey 7 p.ct. 141⅜, Imperial Continental 177, Primitiva 9s., 4 p.ct. (Buenos Ayres) debenture 60, 60⅜, 61, 61¼, Sheffield "C" 103½, South Metropolitan 100¼, Swansea 6½ p.ct. debenture 104. Supplementary prices, British 6 p.ct. mortgage debentures 102½, Liverpool 5 p.ct. 90, 90⅛, Metropolitan Gas (of Melbourne) 7⅜, 7¼, Pinner 6 p.ct. preference 5½, Reading 5 p.ct. maximum 82½.

On **Wednesday**, Alliance and Dublin 65 5/16, Bombay 5s., Bournemouth "B" 12⅝, Brentford "B" 116, British 118, 7 p.ct. preference 128, Cape Town 4½ p.ct. debenture 75, 75½, Continental Union 38, European 8⅝, Gas Light and Coke 95⅞, 96, 96¼, 3½ p.ct. maximum 63¾, 4 p.ct. preference 80¼, Imperial Continental 178, San Paulo 6 p.ct. preference 7⅞, 7 9/16, South Metropolitan 100¼, 100⅜, 100⅜, Swansea 6½ p.ct. debenture 105½, Tottenham "B" 102. Supplementary prices, North Middlesex 5 p.ct. preference 90, Oxford 5 p.ct. debenture 98⅜, Wandsworth 3½ p.ct. new 100.

On **Thursday**, Aldershot "C" 81⅜, Bournemouth "B" 12⅝, Brentford "A" 114½, "B" 114½, 115, Continental Union 37½, 38, 38⅛, European 8⅝, Gas Light and Coke 95⅞, 95¾, 96, 96¼, 3½ p.ct. maximum 63, 4 p.ct. preference 80, 81, Primitiva 8s. 8¼d., 8s. 10¼d., San Paulo 5 p.ct. debenture 43½, South Metropolitan 99⅜, 100¼, 100⅜, Tottenham "B" 103, Uxbridge, 5 p.ct. Maidenhead 93, 93½. Supplementary prices, Gas Light 10 p.ct. bonds 192, Oxford 5 p.ct. debenture 99.

On **Friday**, Bournemouth 6 p.ct. preference 11⅝, Brentford "A" 115½, "B" 116, 117, Continental Union 37½, European 8⅝, Gas Light and Coke 95⅞, 96, 96¼, 4 p.ct. preference 80, 80¼, 81, Hongkong and China 16⅝, 17⅛, Imperial Continental 175½, 177, Primitiva 8s. 6d., 8s. 9d., San Paulo 5 p.ct. debenture 43⅜, South Metropolitan 100¼, 100⅜. Supplementary prices, Colombo 11 15/16, 7 p.ct. preference 9⅛, Oxford 5 p.ct. debenture 99.

Some anxiety exists in the Money Market. The latest Bank returns show the "bankers' balances" reduced to an extremely low level, and although the situation may be relieved by the War Loan dividend distribution at the end of the month, discount rates are expected to rise, and this would adversely affect both Government and Industrial borrowing. Treasury Bills were allotted at £3 14s. 0·65d. p.ct.

Few important changes occurred in the Foreign Exchange Market. Sterling on New York touched 4.64⅜, and finally closed at 4.63 15/16. French and Belgian francs were steady; the former closed at 87.50, and the latter at 95.75. Italian lire cheapened, and finished at 106.87½. The Dutch rate moved in favour of Holland, and closed at 11.54⅞.

Silver was weak with India and China both selling, and the cash price fell to 33 7/16d. per oz. Gold fell 6d., to 89s. 6d. per oz. London.

The Bank rate remains unchanged at 4 p.ct.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Nov. 14.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			%p.a.	%p.a.				
171,978	Stk.	Aug. 14	5	5	Aldershot 5 p.c. max. C.	80—83	..	81⅛
235,492	,,	,,	4	4	Do. 4 p.c. Pref.	72—77	..	..
1,551,868	,,	Sept. 25	6	6½	Alliance & Dublin Ord.	62—67	..	65 5/16—65½
374,000	,,	July 10	4	4	Do. 4 p.c. Deb.	63—68	..	65
300,000	5	Oct. 23	8	8	Bombay, Ltd.	5—5⅛	..	5 5/16
100,000	10	Aug. 14	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
383,110	10	,,	7	7	Do. B 7 p.c.	12⅜—13	..	12⅝—12¾
150,000	10	,,	6	6	Do. Pref. 6 p.c.	10½—11½	..	11⅛
50,000	Stk.	June 26	3	3	Do. 3 p.c. Deb.	57—60	+2	58—59
162,025	,,	,,	4	4	Do. 4 p.c. Deb.	77—80	+2	..
992,045	,,	July 10	6 1/16	6 1/16	Brentford A Con.	112—117	+2	113½—115½
990,500	,,	,,	6⅛	6½	Do. B New	112—117	+2	114½—117
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	87—92	..	..
306,650	,,	June 12	4	4	Do. 4 p.c. Deb.	75—80	..	..
181,337	,,	,,	—	6	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	,,	Aug. 28	11½	11½	Brighton & Hove Orig.	170—175	..	..
244,200	,,	,,	8½	8½	Do. A Ord.	125—128	..	..
1,287,500	,,	July 24	5	5	Bristol 5 p.c. max.	92—93⅛	..	..
855,000	,,	Sept. 25	7	8	British Ord.	115—120	..	117½—118
100,000	,,	June 26	7	7	Do. 7 p.c. Pref.	125—130	..	128
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	72—77	..	..
100,000	10	May 22	6	8	Cape Town, Ltd.	7—8	+⅛	..
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb.	72—77	+1	75—75½
626,860	,,	July 24	6	6	Cardiff Con. Ord.	97—100	..	..
237,860	,,	June 26	7½	7½	Do. 7½ p.c. Red. Deb.	103—106	..	..
157,150	,,	Aug. 14	6½	5	Chester 5 p.c. Ord.	86—91b	..	..
1,513,280	,,	July 24	6	6	Commercial 4 p.c. Cap.	93—96	..	96
560,000	,,	,,	6	6	Do. 3½ p.c. Cap.	93—96	..	96
475,000	,,	June 12	3	3	Do. 3 p.c. Deb.	56—59	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	37—42	−1	37¼—39½
200,000	,,	June 12	7	7	Do. 7 p.c. Pref.	89—94	..	92—92½
660,000	,,	Aug. 28	6½	6½	Croydon sliding scale	101—104	..	..
284,975	,,	,,	5	5	Do. max. div.	84—87	..	..
492,270	,,	Aug. 28	9	6	Derby Con.	107—110c	..	..
55,000	,,	July 10	4	4	Do. Deb.	74—76c	..	..
209,000	,,	Oct. 9	5	5	East Hull 5 p.c. max.	—	..	..
1,002,180	10	July 24	2	6	European, Ltd.	8½—9½	..	8⅛—8 15/16
16,503,045	Stk.	Aug. 14	5⅛	5⅛	Gas Light & Coke 4 p.c. Ord.	95—97	..	95⅝—96⅛
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	61—64	..	63—63½
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	78—81	..	80—81
4,761,930	,,	June 12	3	3	Do. 3 p.c. Con. Deb.	60—63	..	63
130,000	,,	—	10	10	Do. 10 p.c. Bonds	..	..	192
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Sept. 11	6½	6½	Hastings & St. L. 5 p.c. Conv.	93—100	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	75—80	..	..
70,000	10	Sept. 25	10	10	Hongkong & China, Ltd.	16—17	+⅛	16⅞—17⅛
86,600	Stk.	Aug. 14	10	10	Hornsey 7 p.c.	138—143	..	141½
1,976,000	,,	May 22	10	30	Imperial Continental Cap.	175—180	..	..
263,950	,,	Aug. 14	3½	3½	Do. 3½ p.c. Red. Deb.	70—73	..	..
235,242	,,	Aug. 14	6½	6½	Lea Bridge 5 p.c. Ord.	97—102	..	..
2,127,340	,,	Aug. 14	5½	5½	Liverpool 5 p.c. Ord.	90—91b	−⅛	91
600,000	,,	Sept. 25	7	7	Do. 7 p.c. Red. Pref.	102—103b	..	..
165,736	,,	Aug. 28	8	9	Maidstone 5 p.c. Cap.	120—125	..	..
63,480	,,	June 26	3	3	Do. 3 p.c. Deb.	57—58	..	..
75,000	5	,,	5	7	Malta & Mediterranean	3⅛—3⅜	..	..
541,920	Stk.	June 12	4	4	Montevideo, Ltd.	59—62	..	..
1,875,892	,,	July 24	5½	5	Newcastle & Gateshead Con.	83½—84d	+½	83½
250,166	,,	,,	4	4	Do. 4 p.c. Pref.	74—75d	..	..
529,705	,,	June 26	3½	3½	Do. 3½ p.c. Deb.	69—71d	..	..
15,000	10	Aug. 28	11	11	North Middlesex 10 p.c.	16—17	..	..
75,940	10	,,	7 7/10	7 7/10	Do. 7 p.c.	11½—11⅞	..	..
300,000	Stk.	May 8	9	7	Oriental, Ltd.	99—102	..	..
138,120	,,	June 26	7¼	7½	Plym'th & Ston'house 5 p.c.	112—117	..	..
60,000	50	Aug. 28	13	13	Portsea Island B	99—102	..	..
100,000	50	,,	12	12	Do. C	95—100	..	..
2,289,909	1	—	—	—	Primitiva Ord.	8/0—9/0	−/6	8/6—9/0
311,100	100	June 2	4	4	Do. 4 p.c. Red. Deb.	76—79	..	..
600,000	Stk.	July 24	4	4	Do. 4 p.c. Red. Deb. 1911	57—62	..	..
220,335	,,	June 26	4	4	Do. B. Aires 4 p.c. Rd. Db.	57—62	..	60—61½
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	57—62	..	..
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref.	7½—7⅞	+⅛	7½—7 15/16
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	41—44	..	43—43½
270,000	Stk.	Aug. 28	5/8/4	5½	Sheffield A	103—105e	..	..
419,968	,,	,,	5/8/4	5½	Do. B	103—105e	..	..
1,047,000	,,	,,	5/8/4	5½	Do. C	103—105e	..	103½
90,000	10	Oct. 23	8	6	South African	7—9	..	..
6,609,895	Stk.	Aug. 14	6½	5	South Met. Ord.	99—101	..	99⅜—100⅜
102,580	,,	July 10	5	5	Do. Red Pref.	98—100	..	..
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	60—63	+1	60½
734,000	,,	Sept. 11	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	..
91,500	,,	Aug. 28	8½	8½	South Shields Con.	134—137d	..	..
2,087,795	,,	Aug. 14	6½	6½	South Suburban Ord. 5 p.c.	104—109	..	..
368,837	,,	June 26	5	5	Do. 5 p.c. Deb.	93—98	..	..
647,740	,,	Nov. 6	5	5	South'mpt'n Ord. 5 p.c. max.	83—86*	..	..
121,275	,,	June 26	4	4	Do. 4 p.c. Deb.	73—78	..	..
250,000	,,	Aug. 28	7	7	Swansea 7 p.c. Red. Pref.	102—104	..	..
200,000	,,	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	104—106	+2	104—105½
120,000	,,	July 24	8	8	Tottenham District A 5 p.c.	118—121	..	..
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	100—103	..	102—103
181,255	,,	June 12	4	4	Do. 4 p.c. Deb.	76—80	..	..
258,251	,,	Aug. 28	7/14/4	5	Tynemouth Con. and New Wandsworth, Wimbledon, and Epsom—	84—86d	..	..
30,000	,,	July 10	9½	9½	Wandsworth A 5 p.c.	135—140	..	..
255,636	,,	,,	7½	7½	Do. B 3½ p.c.	113—118	..	116½
108,075	,,	,,	6/7/9	6/9/6	Do. C	96—101	..	..
240,865	,,	,,	6/7/9	6/9/6	New Ordinary	..	..	100
352,000	,,	,,	7½	7½	Wimbledon 5 p.c.	110—115	..	112½
98,000	,,	,,	7½	7½	Epsom 5 p.c.	115—120	..	..
88,416	,,	June 26	3	3	3 p.c. Deb.	55—60	..	..

Quotations at:—a.—Bristol, b.—Liverpool, c.—Nottingham, d.—Newcastle, e.—Sheffield. * Ex. div.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 17.

The market for pitch continues quiet, but makers remain firm in their ideas of value at something over 50s. per ton. There is a good deal more inquiry for creosote, and the price is firm at 6¼d. per gallon. Solvent naphtha 95/160, pure benzole, and pure toluole remain without change.

Tar Products in the Provinces.

Nov. 17.

The market for tar products has remained about the same during the past week. Pitch has shown signs of improvement, although we are advised that business has been done on the Continent for January/June delivery at prices which are under the present quotations. There appears to be more inquiry for creosote both for home and export business.

The average values for gas-works products during last week were: Gas-works coal tar, 28s. 9d. to 33s. 9d. Pitch, East Coast, 45s. to 47s. 6d. f.o.b. West Coast—Manchester, 40s. to 42s. 6d.; Liverpool, 41s. to 43s. 6d.; Clyde, 43s. 6d. to 44s. 6d. Benzole 90 p.c., North, 1s. 2d. to 1s. 3d.; crude 65 p.c. at 120° C., 9½d. to 10¼d. naked at makers' works; 50-90 p.c., naked, North, 1s. 2d. to 1s. 3d. Toluole, naked, North, 1s. 3d. to 1s. 4d., nominal. Coal tar crude naphtha in bulk, North, 7d. to 7¾d. Solvent naphtha, naked, North, 1s. 2d. to 1s. 4d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 5d. to 5¼d.; salty, 5d. to 5¼d.; Scotland, 5d. to 5¼d. Heavy oils, in bulk, North, 6¾d. to 7d. Carbolic acid, 60 p.c., 1s. 7d. to 1s. 8d. prompt. Naphthalene, £13 to £15; salts, £4 to £7, bags included. Anthracene, "A" quality, 3¼d. per minimum 40 p.c., purely nominal; "B" unsaleable.

New Company.—A Company under the title of P. Webber, Ltd., has been registered, with a capital of £100, to acquire the business of a gas-lighting specialist carried on by Phineas D. Webber, at Radium Street, Oldham Road, Manchester.

Oriental Gas Company, Ltd.

In the report which will be submitted at the meeting next Wednesday (Nov. 26), the Directors state, with satisfaction, that the revenue account for the year ended June 30 shows a sale of gas eclipsing that of the preceding financial year (which was itself unequalled in the history of the Company) by £6584. On the other hand, the yield by sale of residual products is materially reduced below that of the corresponding period of 1922-23. Essentially this is attributable mainly to two causes: (1) The smaller quantity of coal carbonized, of considerably higher gas-producing quality, yielded a proportionately less quantity of coke for sale; and (2) the lower rates which ruled, owing to a fall in the price of coal and the trade depression which weighed heavily on the Company's field of operation. The other main residual products, tar and sulphate, show nearly an equilibrium between them. The gross trading receipts are thus down about £2330, but this deficit is almost wholly made good by the profit on exchange, amounting to £2308. Good progress, so far as possible, has been achieved with the equipment and plant rendered necessary by the growth of the Company's business. There has been no labour unrest, and relations with the men are entirely harmonious; but the Directors deeply regret to report that a period of excessive heat of unparalleled virulence smote the city, rendering the conditions under which the Company's staff had to carry on most trying and enervating. They were further handicapped by being short-handed, owing to three of the staff being home on leave. However, although some sickness resulted from the abnormal climatic conditions, the Directors are glad to say that the Company's operations were not materially affected. The payment is recommended of a dividend at the rate of 4½ p.ct., less income-tax, making, with the interim dividend of 3½ p.ct., a total of 8 p.ct., less tax, for the year.

At the Mayoral Banquet which took place last week at Aldershot, Mr. R. W. Edwards, Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company, said that Aldershot bore a name which was known throughout the world. This being so, the borough had a duty, the standard of which was higher than in most towns in England. It would never do for Aldershot to fall short in its morality, religion, municipality, sanitation, education, or justice.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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See Illustrated Advertisement, Oct. 8, p. 120.

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Offers for whole or Dozen Lots to the undersigned will be considered.

HARRY H. GRACIE,
Engineer.

15, Calton Hill,
Edinburgh,
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CONTRACTS OPEN.

COUNTY BOROUGH OF DEWSBURY.

(GAS DEPARTMENT.)

THE Corporation of Dewsbury invite TENDERS for the DEMOLITION of an Existing RETORT HOUSE; the Supply and Erection of a STEEL and BRICK RETORT HOUSE, COAL HANDLING PLANT, COAL STORAGE HOPPERS and CONVEYORS, RETORT CHARGING and DISCHARGING MACHINE, RETORT BENCH and FOUNDATIONS, HOT-COKE HANDLING MACHINE and COKE-QUENCHING BENCH, Gas driven ELECTRICAL GENERATING SETS, at the Gas-Works, Savile Town, Dewsbury.

Copies of the General Conditions, Specification, and Form of Tender may be obtained at the offices of the Gas Engineer and Manager, Mr. Henry L. Bateman, Gas-Works, Savile Town, Dewsbury, where plans of the proposed works may be inspected.

Tenders, endorsed "Tender for New Retorts and Coal and Coke Handling Plant," to be delivered to the undersigned not later than the 10th day of December, 1924.

The lowest or any Tender will not necessarily be accepted.

HOLLAND BOOTH,
Town Clerk.

Town Hall,
Dewsbury,
Nov. 15, 1924.

MANCHESTER CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the Supply and Delivery of certain FIRECLAY and SILICA GOODS.

Full Particulars and Form of Tender may be obtained on Application to Mr. J. H. Sillitoe, Secretary, Gas Offices, Town Hall, Manchester.

Sealed Tenders, endorsed "Tender for Fireclay Goods" or "Silica Goods," as the case may be, addressed to the Chairman of the Gas Committee, must be Delivered at the Gas Offices, Town Hall, Manchester, not later than 10 a.m. on Thursday, the 27th of November, 1924.

The Gas Committee do not bind themselves to accept any Tender, and reserve to themselves the right to divide any Offer as they may deem advisable.

By order,
P. M. HEATH,
Town Clerk.

Town Hall,
Manchester,
November, 1924.

MANCHESTER CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the Supply, Delivery, and Erection of a COOLING TOWER at their Bradford Road Gas-Works.

Specification and Form of Tender may be obtained on Application to Mr. J. H. Sillitoe, Secretary, Gas Department, Town Hall, Manchester.

Permission to view the Site and any other information obtained on Application to Mr. Wm. Newbigging, Consulting Engineer, at his office, No. 5, Norfolk Street, Manchester.

Sealed Tenders, in official envelope, addressed to the Chairman of the Gas Committee, and endorsed "Cooling Tower, Bradford Road Works," must be Delivered at the Gas Offices, Town Hall, Manchester, not later than 5.0 p.m. on Thursday, the 11th of December, 1924.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

By order,
P. M. HEATH,
Town Clerk.

Town Hall,
Manchester,
November, 1924.

MANCHESTER CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the CONSTRUCTION and ERECTION of a BOILER HOUSE and PUMP HOUSE EXTENSION at their Bradford Road Works.

Specification, Bill of Quantities, and Form of Tender may be obtained on Application to Mr. J. H. Sillitoe, Secretary, Gas Department, Town Hall, on payment of One Guinea, which will be returned on receipt of a *bona fide* Tender.

Drawings may be seen, permission to View the Site, and any other information obtained, on Application to Mr. Wm. Newbigging, Consulting Engineer, at his office, No. 5, Norfolk Street, Manchester.

Sealed Tenders, in official envelope, addressed to the Chairman of the Gas Committee, and endorsed "Boiler House, Bradford Road Station," must be Delivered at the Gas Offices, Town Hall, Manchester, not later than 5.0 p.m. on Thursday, the 11th of December, 1924.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

By order,
P. M. HEATH,
Town Clerk.

Town Hall,
Manchester,
November, 1924.

COUNTY BOROUGH OF STOKE-ON-TRENT.

(GAS DEPARTMENT.)

GAS CONSOLIDATION ACT (1929).

THE Gas Committee invite Tenders for the Erection complete of:

CONTRACT No. 25.—SULPHATE OF AMMONIA PLANT.

CONTRACT No. 26.—TAR DISTILLATION PLANT.

Persons desirous of Tendering are requested to make written application to the Chief Gas Engineer, Gas Works, Etruria, Stoke-on-Trent, from whom all Particulars may be obtained, not later than Thursday, the 27th of November, and to enclose a Deposit of £1 Treasury Note for each Contract, which will be returned on receipt of a *bona-fide* Tender.

Sealed Tenders to be forwarded to the undersigned not later than Twelve noon on Tuesday, Dec. 2, 1924, and endorsed "Tender for ....."

E. B. HARPLEY,
Town Clerk.

Town Hall, Stoke-on-Trent.

BOROUGH OF TORQUAY.

(ST. MARYCHURCH GAS UNDERTAKING.

THE Gas Committee of the Torquay Town Council are prepared to consider TENDERS for the Supply of 1700 Yards of 8-in. STEEL or WROUGHT IRON MAIN, with SPECIALS, delivered at Torre Railway Station. Tenderers to state Material of which their Tubes are made, Type of Joint, and give alternative prices for Coated and Uncoated internally.

Any further information may be obtained from the undersigned, to whom Tenders should be Delivered endorsed "8-in. Main," by Monday, the 1st of December next.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

FRANCIS CHALMERS,
Engineer and Manager.

Gas-Works,
St. Marychurch, Torquay,
Nov. 14, 1924.